UNIVERSIDADE ESTADUAL DE CAMPINAS
FACULDADE DE ODONTOLOGIA DE PIRACICABA

MARIANA MARINHO DAVINO DE MEDEIROS

QUALIDADE DE VIDA, CONDIÇÃO BUCAL E ESTADOS NUTRICIONAL E FÍSICO DE IDOSOS EM INSTITUIÇÕES DE LONGA PERMANÊNCIA: UM ESTUDO MULTICÊNTRICO

QUALITY OF LIFE, ORAL CONDITION AND NUTRITIONAL AND PHYSICAL STATES OF ELDERLY IN NURSING HOMES: A MULTICENTER STUDY

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Dissertação apresentada à Faculdade de Odontologia de Piracicaba da Universidade Estadual de Campinas como parte dos requisitos exigidos para a obtenção do título de Mestra em Clínica Odontológica, na Área de Prótese Dental.

Dissertation presented to the Piracicaba Dental School of the University of Campinas in partial fulfillment of the requirements for the degree of Master in Dental Clinic, in Prosthodontics area.

Orientadora: Profª. Drª. Renata Cunha Matheus Rodrigues Garcia

Esse exemplar corresponde à versão final da dissertação defendida pela aluna Mariana Marinho Davino de Medeiros e orientada pela Profª. Drª. Renata Cunha Matheus Rodrigues Garcia.

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PROFª. DRª. RENATA CUNHA MATHEUS RODRIGUES GARCIA

PROFª. DRª. ANA CAROLINA PERO VIZOTO

PROF. DR. YURI WANDERLEY CAVALCANTI

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RESUMO

O impacto da institucionalização na Qualidade de Vida (QV) dos idosos está em discussão. Tal população apresenta função mastigatória deficiente que pode comprometer sua nutrição e Qualidade de Vida Relacionada à Saúde Bucal (QVRSB). Ademais, desnutrição e fragilidade estão comumente sobrepostas em idosos institucionalizados, causando morbimortalidade. Essa dissertação, por meio de três artigos científicos, objetivou: (1) verificar, por revisão sistemática e meta-análise, a influência da institucionalização na QV de idosos; (2) avaliar a influência da presença de dentes e prótese na performance mastigatória e limiar de deglutição, e a correlação desses parâmetros mastigatórios com nutrição e QVRSB em amostra multicêntrica de idosos institucionalizados; e (3) investigar, em perspectiva multicêntrica, os fatores associados à coexistência de fragilidade e desnutrição em idosos institucionalizados. Na revisão sistemática, estudos observacionais que avaliaram QV de idosos institucionalizados e não institucionalizados foram incluídos. Realizou-se meta-análise e análise da força de evidência. Nos segundo e terceiro artigos, idosos institucionalizados (n=344; idade média(DP)=77,70(9,10)) foram selecionados em 17 instituições de longa permanência para idosos de Piracicaba e João Pessoa. Exames bucais foram realizados para classificar os idosos em: desdentados com e sem prótese total (PT) e parcialmente dentados com e sem prótese. A performance mastigatória foi avaliada por goma de mascar e o limiar da deglutição pelos ciclos de mastigatórios realizados até deglutição de amendoim. A nutrição foi avaliada por aplicação do "Mini-Nutrition Assessment Short-Form" e mensuração de medidas corporais. A QVRSB foi avaliada pelo "Geriatric Oral Health Assessment Index" (GOHAI) e "Oral Health Impact Profile" (OHIP-14). A fragilidade foi avaliada por questionário de Fried modificado. Teste de Kruskal-Wallis (α=0,05) avaliou a influência da presença de dentes e próteses na função mastigatória. Correlação de Spearman (α=0,05) correlacionou função mastigatória com nutrição e QVRSB. Regressão de Poisson (α=0,05) associou a sobreposição de fragilidade e nutrição com variáveis independentes, obtendo Razão de Prevalência (RP). A meta-análise mostrou pior QV para os idosos institucionalizados comparados aos não institucionalizados. Desdentados sem PT apresentaram pior performance mastigatória do que os desdentados com PT e parcialmente dentados com ou sem prótese ($p<0,05$). O limiar de deglutição dos desdentados com PT e parcialmente dentados com prótese foi maior que dos desdentados sem PT e parcialmente dentados sem prótese ($p<0,05$). A função mastigatória não foi correlacionada com a nutrição. A performance mastigatória foi correlacionada com o GOHAI (r^2=-0,154) e o limiar de deglutição com o GOHAI (r^2=0,162) e OHIP-14 (r^2=-0,146). A coexistência de

fragilidade e desnutrição (n=139, 40,5%) foi associada à idade avançada (RP=1,009), maior número de medicamentos (RP=1,016), maior dependência em atividades diárias (RP=1,061), menor força de preensão palmar (RP=0,992) e menor IMC (RP=0,997). Concluiu-se que a institucionalização afeta negativamente a QV dos idosos. A ausência de dentes e prótese influenciou a performance mastigatória e limiar da deglutição em idosos institucionalizados. A função mastigatória não influenciou a nutrição desses indivíduos, apesar de ter prejudicado sua QVRSB. A sobreposição de fragilidade e desnutrição foi prevalente e associada à idade avançada, maior uso de medicamentos e dependência em atividades diárias, e menor força máxima de preensão e IMC.

Palavras-chave: Instituição de longa permanência para idosos, qualidade de vida, mastigação, estado nutricional, idoso fragilizado.

ABSTRACT

The impact of the institutionalization on elderly's quality of life (QoL) is under discussion. This population presents a poor masticatory function that can compromise their nutrition and Oral Health-Related Quality of Life (OHRQoL). Moreover, malnutrition and frailty are commonly overlapped in institutionalized elderly, causing morbimortality. This dissertation, through three scientific articles, aimed to: (1) verify, through a systematic review and meta-analysis, the influence of the institutionalization on elderly's QoL; (2) evaluated the influence of presence of teeth and prosthesis on masticatory performance and swallowing threshold in a multicenter sample of nursing homes elders, and the correlation of these masticatory parameters with nutrition and OHRQoL; and (3) investigate, in a multicenter approach, the factors associated with the overlap of frailty and nutrition in institutionalized elderly. For the systematic review, observational studies that assessed QoL of institutionalized and community dwelling elderly were included. Meta-analysis and certainty of evidence were performed. For the second and third articles, institutionalized elders (n=344; mean age(SD)=77.70 (9.10)) were selected from 17 nursing homes of Piracicaba and João Pessoa. Oral examinations were performed to classify the elderly in: edentulous with and without complete dentures (CD) and partially dentate with and without prosthesis. Masticatory performance was assessed using a chewing gum and swallowing threshold by chewing cycles performed until swallow of peanuts. The nutrition was screened by applying Mini Nutrition Assessment Short-Form and measurement of body composition. The OHRQoL was evaluated through Geriatric Oral Health Assessment Index (GOHAI) and Oral Health Impact Profile (OHIP-14). Frailty was screened by a modified Fried's questionnaire. Kruskal-Wallis test (α=0.05) evaluated the influence of presence of teeth and prosthesis on masticatory function. Spearman's Correlation (α=0.05) correlated masticatory function with nutrition and OHRQoL. Poisson Regression (α=0.05) associated frailty and nutrition overlapped with independent variables, obtaining Prevalence Ratio (PR). The meta-analysis showed a worse QoL for the institutionalized elderly compared to community dwelling ones. Edentulous elderly without CD had lower masticatory performance than edentulous with CD and partially dentate with or without prosthesis ($p<0.05$). The swallowing threshold of edentulous with CD and partially dentate with prosthesis were greater than those edentulous without CD and partially dentate without prosthesis ($p<0.05$). Masticatory function was not correlated with nutrition. Masticatory performance was correlated with GOHAI (r^2=-0.154) and swallowing threshold with GOHAI (r^2=0.162) and OHIP-14 (r^2=-0.146). The coexisting of frailty and malnutrition (n=139, 40.5%) was associated with advanced

age (PR=1.009), greater number of medications (PR=1.016), greater dependence for ADL (PR=1.061), lower maximal grip strength (PR=0.992) and lower BMI (PR=0.997). It was concluded that institutionalization negatively affect elderly's QoL. The absence of teeth and prosthesis influenced masticatory performance and swallowing threshold in institutionalized elderly. The masticatory function did not influence institutionalized elders' nutrition, despite impair their OHRQoL. Frailty and malnutrition overlapped were prevalent and associated with advanced age, greater use of medicines and dependence for ADL, and lower maximal grip strength and BMI.

Keywords: nursing homes, quality of life, mastication, nutritional status, frail elderly.

SUMÁRIO

1 INTRODUÇÃO

A taxa de mortalidade está diminuindo em todo mundo com reflexo no aumento da longevidade da população, o que leva ao maior crescimento do grupo etário de 60 anos ou mais (Reher et al., 2015; Wilmoth, 2000; Mathers et al., 2015). Mesmo em países subdesenvolvidos, observa-se e projeta-se aumento da expectativa de vida ao nascer e da proporção de idosos (IBGE, 2010). No Brasil, a expectativa de vida que no ano 2000 era de 69,83 anos, será de 78,64 anos em 2030, atingindo uma taxa de crescimento demográfico de 13,44% da população idosa (IBGE, 2010).

Nessa perspectiva, demonstra-se a evidente tendência de envelhecimento demográfico, que é definido como um processo dinâmico e progressivo, que ocasiona danos biológicos em nível molecular e celular (WHO, 2015). Esses danos causam modificações morfológicas e fisiológicas que aumentam a vulnerabilidade e o aumento da incidência de processos patológicos (WHO, 2015). Sendo assim, o processo de envelhecimento da população mundial tem sido acompanhado por problemas como edentulismo, desnutrição e fragilidade (Silva e Farias et al., 2018; Dominguez & Barbagallo, 2017; Woo et al., 2017).

O avanço da idade causa declínio da atividade dos músculos esqueléticos, o que leva a dificuldade de manutenção da higiene bucal e consequente aumento do acúmulo de biofilme. Assim, há um favorecimento da incidência de agravos bucais, que podem resultar em perda dentária (Figura 1).

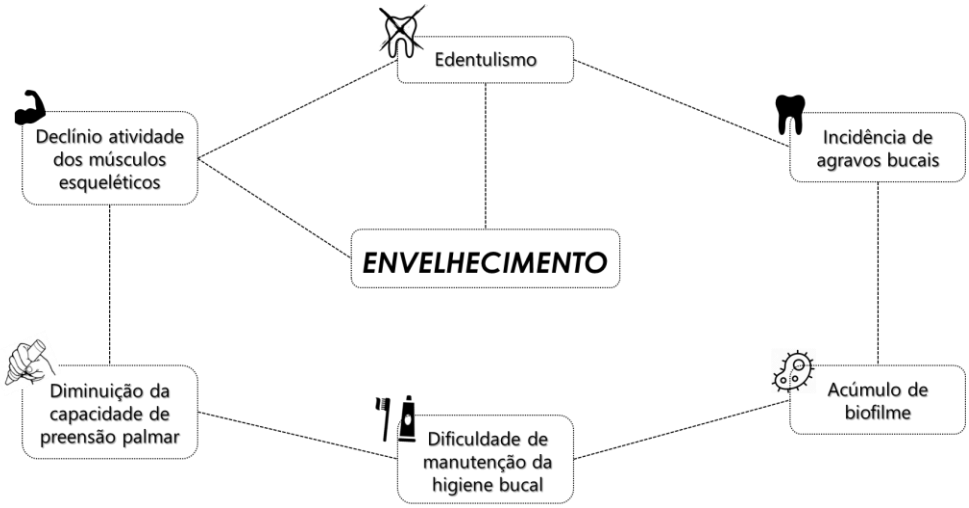

Figura 1. Modelo teórico-conceitual sobre a relação do envelhecimento com o edentulismo.

Além disso, o envelhecimento compromete o paladar e o olfato, reduzindo o apetite, modificando os hábitos alimentares e diminuindo a ingestão alimentar (Dominguez &

Barbagallo, 2017; Meier & Stratton, 2008; Volkert et al., 2019). Com isso, a composição corporal e a absorção de nutrientes ficam descompensadas, podendo resultar em desnutrição (Figura 2) (Dominguez & Barbagallo, 2017; Meier & Stratton, 2008; Volkert et al., 2019).

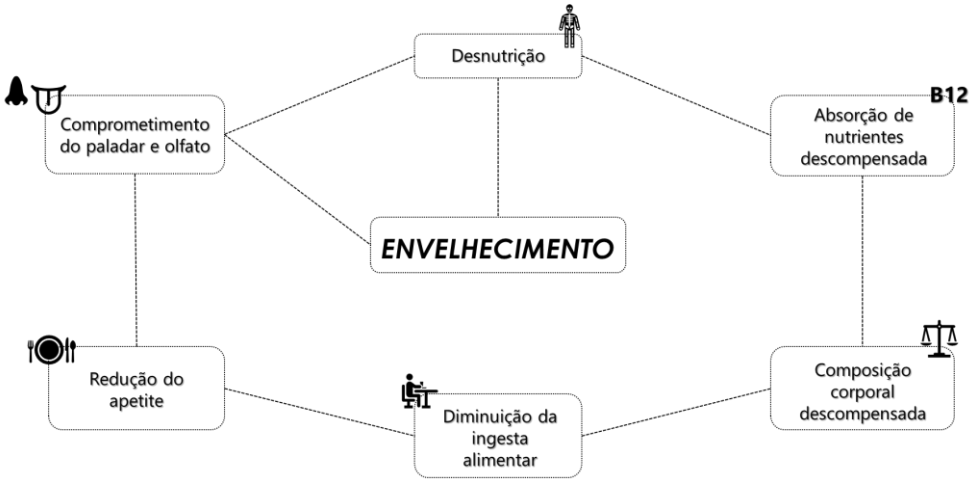

Figura 2. Modelo teórico-conceitual sobre a relação do envelhecimento com a desnutrição.

Ademais, as reservas fisiológicas e resistência do organismo também são reduzidas com o envelhecimento, o que leva à diminuição de massa muscular esquelética e perda de controle motor e força, características correspondentes ao quadro de fragilidade (Figura 3) (Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019). Isto posto, indivíduos edêntulos, desnutridos e frágeis apresentam menor capacidade funcional e maior morbimortalidade (Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019; Dominguez & Barbagallo, 2017; Santana et al., 2019; Koka & Guptad, 2018).

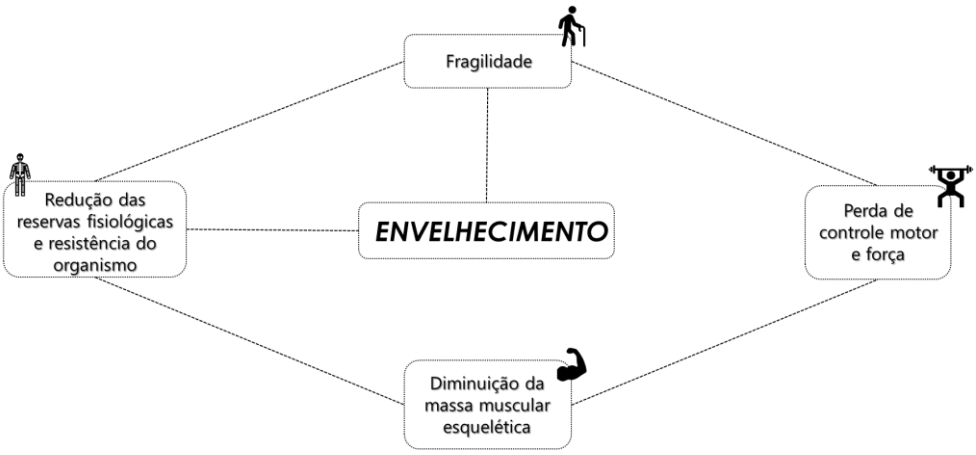

Figura 3. Modelo teórico-conceitual sobre a relação do envelhecimento com a fragilidade.

A presença dessas síndromes geriátricas faz com que o idoso necessite de cuidados diários (Dominguez & Barbagallo, 2017; Meier & Stratton, 2008; Volkert et al., 2019; Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019). Contudo, na rotina da vida moderna, há uma diminuição da disponibilidade dos familiares para auxiliar os idosos (Luppa et al., 2010; Del Duca et al., 2012). Na busca de um cuidado especializado, os idosos deixam de morar livres na comunidade e passam a residir em instituições de longa permanência, ou seja, ocorre um aumento da institucionalização (Luppa et al., 2010; Del Duca et al., 2012). Portanto, o comprometimento funcional, e a falta de apoio e assistência durante as atividades diárias são, respectivamente, fatores preditores e agravantes do processo de institucionalização dos idosos (Luppa et al., 2010; Del Duca et al., 2012).

Nesse sentido, as instituições de longa permanência para idosos devem proporcionar um envelhecimento ativo desses indivíduos, visando a continuidade da saúde, ou seja, do bem-estar físico, social e mental, assim como da participação social, proteção, segurança e cuidados assistenciais (WHO, 2002; Campos et al., 2015). Esse conceito não se restringe apenas às boas condições de saúde, mas abrange também questões sociais, econômicas, culturais, espirituais e cívicas (WHO, 2002; Campos et al., 2015). Assim, o idoso poderá obter percepções favoráveis de sua posição na vida, dentro de um contexto cultural, em relação aos seus objetivos, expectativas, preocupações e desejos, culminando em melhor Qualidade de Vida (QV) (WHO, 1995).

Entretanto, o idoso institucionalizado constitui um grupo vulnerável, privado de suas atividades rotineiras e restrito de seus contatos interpessoais, o que pode comprometer seu bem-estar. Sendo assim, viver em uma instituição de longa permanência pode afetar a QV dos idosos. Vários estudos (Akça; Sahin, 2008; Alcarde et al., 2010; Bodner et al., 2011; Bodur; Cingil, 2009; Bonan et al., 2008; Cucato et al., 2016; Dagios et al., 2015; Even-Zohar, 2014; Herazo-Beltrán et al., 2017; Khoury & Choi et al 2017; Kuok et al., 2017; Rachadel et al., 2015; Ramocha et al., 2017; Ramos et al., 2012; Urciuoli et al., 1998; Vitorino et al., 2013) compararam a QV de idosos institucionalizados com a de idosos moradores da comunidade, e resultados divergentes foram encontrados. Portanto, é necessário solucionar essas controvérsias por meio de sumarização qualitativa e quantitativa dos achados desses estudos de forma a estabelecer uma conclusão robusta, baseada em evidências referentes à influência da institucionalização na QV dos idosos.

Não obstante, idosos residentes em instituições de longa permanência, quando comparados aos moradores da comunidade, apresentam pior condição de saúde bucal, relacionada ao edentulismo e uso de prótese (Silva e Farias et al., 2018; Piuvezam et al., 2013;

Ferreira et al., 2018). A perda dentária, quando não substituída por próteses dentárias, compromete a mastigação, o estado nutricional e Qualidade de Vida Relacionada à Saúde Bucal (QVRSB) em idosos institucionalizados (Klotz et al., 2019; Van Lancker et al., 2012; Wong et al., 2019). Entretanto, apenas um estudo (Klotz et al., 2019) avaliou a associação entre presença de dentes e uso de prótese com a performance mastigatória em idosos institucionalizados por meio de método quantitativo, utilizando uma goma de mascar de duas cores. No entanto, os resultados desse estudo podem ter sido influenciados pela inclusão de idosos com idade avançada e demência (Klotz et al., 2019).

Residir em uma instituição de longa permanência para idosos também pode influenciar a prevalência e os fatores associados à fragilidade e desnutrição (Dominguez; Barbagallo, 2017; Kojima, 2018; Kaiser et al., 2010; Meier; Stratton, 2008). Ademais, embora frequentemente haja uma coexistência da fragilidade e desnutrição (Laur et al., 2017), essa sobreposição não foi considerada durante a avaliação dos fatores associados a essas duas síndromes geriátricas em idosos institucionalizados, principalmente em perspectiva multicêntrica.

Diante do exposto, esse trabalho de dissertação teve por objetivos: *(1)* sumarizar e verificar, por meio de revisão sistemática da literatura e meta-análise, a influência da institucionalização na QV de idosos; *(2)* avaliar a influência da presença de dentes e uso de prótese na performance mastigatória e no limiar de deglutição, bem como a correlação desses parâmetros mastigatórios com o estado nutricional e a QVRSB em uma amostra multicêntrica de idosos institucionalizados; e *(3)* investigar, em uma perspectiva multicêntrica, os fatores associados à coexistência de fragilidade e desnutrição em idosos residentes em instituições de longa permanência.

2 ARTIGOS

Este trabalho foi realizado no formato alternativo, conforme a Informação CCPG/001/2015, da Comissão Central de Pós-Graduação (CCPG) da Universidade Estadual de Campinas.

O artigo 1, intitulado "Does the institutionalization influence elderly's quality of life? A systematic review and meta-analysis", foi publicado no periódico *BMC Geriatrics*.

O artigo 2, intitulado "Masticatory function influences oral health-related quality of life, despite it is not correlated with nutritional status of elderly in nursing homes", submetido à publicação no periódico *Journal of Oral Rehabilitation*.

O artigo 3, intitulado "Factors associated with the overlap of frailty and nutrition in institutionalized elderly: a multicenter study", em revisão no periódico *Archives of Gerontology and Geriatrics*.

2.1 ARTIGO 1

Does the institutionalization influence elderly's quality of life? A systematic review and meta-analysis

Short title: Quality of life of institutionalized elderly

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Conflict of Interest

MMDM received MSc scholarship from FAPESP and she declare no conflicts of interest. TMC received MSc scholarship from CAPES and she declare no conflicts of interest. MBM received PhD scholarship from CAPES and FAPERJ and she declare no conflicts of interest. All other authors were not sponsored and they declare no conflict of interest.

Ethical approval

This study did not involve human participants. This study is in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Does the institutionalization influence elderly's quality of life? A systematic review and meta-analysis

Short title: Quality of life of institutionalized elderly

Abstract

Background: Institutionalization is a global phenomenon and its impact on elderly's quality of life (QoL) is under discussion. This systematic review and meta-analysis evaluated the influence of the institutionalization on elderly's QoL. *Methods:* Searches were performed in Medline, Scopus, Web of Science, Lilacs, Cochrane Library and SIGLE by two independent reviewers up to May 2019. The eligibility criteria were based on PECO strategy, considering observational studies in elderly (P), which were (E) or not (C) institutionalized to identify differences in their QoL (O). For qualitative synthesis, data were extracted and risk of bias was evaluated through a validated guideline. Meta-analysis was based on Mean Difference (MD) and Standard Mean Difference (SMD) calculation ($p \leq 0.05$). The evidence was quality-tested using Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. *Results:* The initial search identified 3841 articles. Duplicates were removed, titles and abstracts were read and eligibility criteria were applied, remaining 16 cross-sectional studies that were included for data extraction and qualitative synthesis. Out of 16 articles, 14 evaluated the Health-Related Quality of Life, using Leipad (n=2), WHOQOL-BREF and/or OLD (n=8), SF-36 or RAND-36 (n=4) questionnaires, and two assessed the Oral Health–Related Quality of Life, through GOHAI questionnaire. One eligible article was considered as low risk of bias. In the meta-analysis, 12 studies were included. Leipad questionnaire did not show differences on elderly's QoL (MD 0.11 [CI95%-0.10, 0.32] I^2=76%). Differences on elderly's QoL were detected through WHOQOL-BREF (SMD -0.70 [CI95%: -0.94, -0.47] I^2=93%), WHOQOL-OLD (SMD -1.13 [-1.47, -0.80] I^2=91%) and SF-36/RAND-36 (MD -

5.97 [CI95%: -11.29, -0.64] I^2=90%). All studies had very low or low certainty of evidence, since the study design influenced evidence classification, and show high heterogeneity. *Conclusion:* Although the institutionalization influences negatively the elderly's QoL, further well-designed studies are needed to confirm this evidence.

Key-words: Aged; Institutionalization; Nursing Homes; Independent Living; Quality of life.

Background

The elderly population is growing worldwide in greater rates [1], as a result of increased longevity and lower mortality rates [2, 3]. In view of this, there is a concern about the active aging process, in which the continuing participation of aged people on daily activities is enhanced [4]. Active aging refers to keep elderly health and on the control of their daily activities. This may generate better Quality of Life (QoL) [5], represented by favourable perceptions of their position in life, within a cultural context, in relation to their goals, expectations, concerns and desires [6]. Therefore, active aging refers to the physical, social and mental well-being, as well as, social participation, protection, safety, and care of the elderly to avoid disabilities, chronic diseases and less use of health care services [4].

Although the importance of active aging and better QoL for the elderly is evident, there is a lack of family care, which increases the elderly's institutionalization and, by consequence, increase the number of community-dwelling aged people who became residents of nursing homes [7]. Advance age, not having a home or a partner, low educational level, sedentary lifestyle, poor self-rated health status, high number of drug prescriptions and functional and cognitive impairments are the main predictors of the institutionalization process [7, 8]. In addition, the lack of support and assistance to the elderly during daily activities is suggested as an aggravating factor for stimulating elderly's institutionalization [7].

Considering the raised institutionalization rates, nursing homes should provide good quality of life for their residents [9]. In this sense, studies [10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25] sought to understand if lives in homes for the aged may influence the elderly's QoL. Thereby, worse QoL was observed in elderly residents of long-term care institutions, in comparison with community-dwelling individuals [11, 13, 16, 17, 18, 19, 22, 23, 25]. In addition, the literature has shown that the elderly residing in nursing homes or institutionalized elderly have lower educational level [13, 25], poorer health status [13, 25], higher dependency level [18], higher risk of falls [18], lower physical activity [18, 22], lower decision-making ability [23], lower leisure activities [25] and are older [13, 25].

In contrast, a study found better QoL of institutionalized elderly men compared to the non-institutionalized elderly in physical and psychological domains [15], which was attributed to the multidisciplinary professional team offering support and stimulus to the institutionalized elderly. Other studies did not find differences in the QoL between institutionalized elderly and non-institutionalized elderly [14, 20]. Finally, divergent results, from different QoL questionnaire domains were observed between institutionalized and non-institutionalized elderly [10, 12, 21, 24].

Considering this, it is important solve such controversies in order to know if the institutionalization influence the QoL and in which domains. Thus, this knowledge can support the homes for the aged in performing actions and better care for the elderly in view of the promotion of a good QoL for these individuals. Therefore, the purpose of this systematic review and meta-analysis was to summarize these findings and verify the influence of institutionalization on the elderly's general health and oral health related QoL.

Material and Methods

Study Design, Focused Question, Registration and Protocol

A systematic review and meta-analysis were conducted in order to answer the focused question: Does institutionalization interfere with elderly's quality of life? The focused question was based on Population, Exposure, Comparison and Outcome (PECO) strategy [26]. This systematic review and meta-analysis investigated if elderly (P) who are institutionalized (E), compared to non-institutionalized (community-dwelling) (C), present worse QoL (O). Thereafter, this review was registered in the PROSPERO database (protocol number: CRD42018106641) and was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [27].

Literature search strategy

The literature search strategy was performed independently by two examiners, MMDM and TMC, up to May 2019 in the following electronic databases: PubMed (MEDLINE), Scopus, Web of Science, LILACS, Cochrane Library and System for Information on Gray Literature in Europe (SIGLE). MeSH terms, key words and free terms related to the topic of this systematic review were used within the search strategy. Boolean operators (OR, AND) was used to combine the search terms. In addition, the search strategy followed the syntax rules of each database, as shown in Table 1. Studies that covered the focused question: "Does the elderly who lives in nursing homes, compared to community-dwelling elderly, present worse QoL?", and published up to May 2019 were included, without restriction of publication date or language. Furthermore, the references of all the selected studies were hand searched to retrieve articles that might have been lost in the search strategy. Finally, the ongoing or in press articles were searched through the contact with the experts by email and in abstracts and presentation from national and international dental meetings [28].

Eligibility criteria

The inclusion criteria were based on the elements of the PECO strategy [26], considering observational studies that compared elderly (P), which were (E) institutionalized or not (C), in order to identify differences in their Quality of Life (O). People aged 60 years old or more was considered elderly, following the World Health Organization (WHO) and United Nations definition. Moreover, aged people who lived in a nursing home was considered institutionalized.

References from database searches were imported into the Mendeley Desktop software (Mendeley Desktop, version 1.16.1, ©2008–2016 Mendeley Ltd., Elsevier Inc., NY, USA). This reference manager software was used to remove the duplicates, followed by title and abstract reading. Two examiners (MMDM and TMC) analyzed independently the study designs and excluded references that did not meet the inclusion criteria (observational studies), such as editorials, letters to editor, literature reviews, case reports, case series. In addition, following the eligibility criteria, observational studies that did not include a group of comparison (non-institutionalized individuals) also were not included. Subsequently, titles and abstracts of the searched papers were analyzed for possible inclusion, according to the eligibility criteria. In case of title and abstract provided insufficient information to accomplish a proper exclusion, full-text was also read to resolute any doubts and the final decision was made.

In this stage, studies that met the eligibility criteria, however, were about Alzheimer's disease, dementia, mental retardation or disability, articles that used Likert scale and Visual Analogue Scale (VAS) to assess QoL, as well as, validation studies of the QoL questionnaire were excluded of this systematic review, being these the exclusion criteria. After that, the full texts were read and evaluated. Thus, the minimum sample size considered to the studies was 61 individuals. The results of both reviewers were compared, and any inconsistency was solved with a third examiner (YWC).

Data extraction

Data were extracted independently by the two examiners (MMDM and TMC) and organized in an electronic spreadsheet (Table 2): (1) author, year of publication and geographical location; (2) study design; (3) sample size: numbers of participants; (4) sample characteristics: gender and age; (5) data collection; and (6) results. The spreadsheets of the two examiners were compared, and if any inconsistency was founded, a third examiner (YWC) solved the doubts.

Quality assessment and risk of bias

Two examiners (MMDM and TMC) carried out the evaluation of the methodological quality of included studies, according to Fowkes and Fulton guidelines [29]. The guidelines proposed a checklist for appraising a medical article based in the following domains: (1) study design appropriate to objectives; (2) representativeness of study sample; (3) control group; (4) quality of measurements and outcomes; (5) completeness; and (6) distorting influences. In addition, each guideline criteria were classified according to the authors decision, after reading the content of the eligible articles, as shown in Table 3.

This classification helped to score each part of the domains of the checklist using a symbol, with the following meanings: major problem (++), minor problem (+), no problem (0) or not applicable (NA). After evaluating studies according to Fowkes and Fulton guidelines [29], the two examiners classified the studies according to the presence or absence of: (1) bias; (2) confounding factors; and (3) results occurred by chance. Studies without any problem within their domains or that solved the problems were considered sound. After quality assessment and in cases of divergence, a third researcher (YWC) proposed a consensus for the analysis.

Meta-analysis (quantitative synthesis)

The data were analysed using RevMan software (Review Manager v. 5.3, The Cochrane Collaboration; Copenhagen, Denmark) to assess the influence of the institutionalization on the elderly's QoL. Different questionnaires were used in the studies (LEIPAD, WHOQOL-OLD, WHOQOL-BREF and SF-36, RAND-36). Therefore, separated meta-analysis (MA) was performed for each group of QoL questionnaires [30]. Sub-grouped analysis was performed according to the domains included in each questionnaire [30]. For the MA report, the mean difference was applied to the study outcomes using the same scale range; the standard mean difference was applied to the studies with different scale ranges [31]. In all analysis, a 95% confidence interval (CI) and random effect model were applied. Heterogeneity was tested using the I^2 index.

Certainty of evidence

The certainty of the evidence (certainty in the estimates of effect) was determined for the outcome using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach [32]. Observational studies start as low evidence, and the quality of the body of evidence decreases to very low if serious or very serious issues related to risk of bias, inconsistency, indirectness, imprecision and publication bias are present. In addition, the quality of the evidence can be upgraded if the magnitude of effect is large or very large, or if the effect of all plausible confounding factors would reduce the effect, or suggest a spurious effect. In this way, the quality of the evidence can vary from very low to high.

Results

Study Selection

A diagram of the source and selection procedures, according to the PRISMA guidelines [27], is shown in Fig.1. The initial search identified a total of 3841 references. Of this total,

1233 duplicates were removed, remaining 2608 studies. Title and abstract screening resulted in exclusion of 2566 records according to the eligibility criteria. Thus, 42 studies were selected for full-text reading. From that, 26 articles were excluded: one full text was not available (even after three attempts of contact with authors) and 25 did not meet the eligibility criteria. Out of these 25 studies, 10 did not compare the QoL of institutionalized and non-institutionalized elderly; three used Likert scale or VAS for QoL evaluation; five were validation studies of the QoL questionnaire; and seven included participants with Alzheimer's disease, dementia, cognitive impairment or disability. Sixteen studies were included for the data extraction and qualitative synthesis [10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25] and 12 for the quantitative synthesis [10, 12, 13, 16, 17, 18, 20, 21, 22, 23, 24, 25].

Characteristics of included articles

Characteristics of included studies are detailed in Table 4. All retrieved papers adopted the cross-sectional design. The articles were published between 1998 [24] and 2017 [18, 20, 22], in seven different countries. Out of all included studies, seven (43.5%) were performed in Brazil. The sample sizes ranged from 61 (21 institutionalized elderly and 40 non-institutionalized elderly) [21], to 354 (66 institutionalized elderly and 288 non-institutionalized elderly) [25]. The lowest cut-off point for age considered in the studies was 50 years [20] and the highest was 88 years [24]. Furthermore, 56.5% (n=9) of the studies included considered 60 years as the cut-off point for age [10, 11, 13, 16, 19, 21, 22, 23, 25].

Of 16 articles evaluated in this systematic review, 14 evaluated the Health-Related Quality of Life (HRQoL) using Leipad (n=2) [10, 24], WHOQOL-BREF and/or OLD (n=8) [13, 15, 16, 17, 19, 20, 23, 25], SF-36 or RAND-36 (n=4) [12, 18, 21, 22] questionnaires. Two studies assessed the Oral Health–Related Quality of Life (OHRQoL), through GOHAI questionnaire [11, 14].

Eight studies reported that institutionalization impacted negatively the elderly's HRQoL [13, 16, 17, 18, 19, 22, 23, 25]. However, one study found better HRQoL in the institutionalized elderly compared to the non-institutionalized elderly [15]. In addition, one study did not find a significant difference in the HRQoL of institutionalized elderly compared to the non-institutionalized elderly [20]. In relation to the OHRQoL, one study showed that institutionalized elderly had worse QoL compared to non-institutionalized elderly [11], whilst other paper did not find a significant difference in the QoL between the groups [14].

Risk of bias within studies (qualitative synthesis)

The risk of bias assessment [29] is presented in Table 3. Thirteen articles (81.2%) selected the participants in more than one nursing homes [10, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25], which was considered as "no problem" (0) once it provides a more representative sample of the population. Fourteen studies (87.6%) used a convenience sample as the sampling method [10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24, 25] and was classified as "major problem" (++). The sample size was evaluated according to the power of the study that was considered high (equal to or greater than 80%) in 62.5% (n=10) of the studies included in this systematic review [10, 12, 13, 15, 16, 17, 18, 20, 21, 23]. In contrast, eleven articles (68.7%) presented only the inclusion or exclusion criteria, classified as minor problem (+) [12, 14, 15, 16, 18, 19, 20, 21, 23, 25]. For this reason, it is possible that confounding factors exists. Despite of this, a response rate of 100% was present in thirteen studies (91.2%) [10, 11, 13, 14, 15, 17, 18, 19, 21, 22, 23, 24].

All the articles included in this systematic review correctly defined the control group. In another hand, in relation to the source of controls, 87.5% (n=14) of the articles selected the non-institutionalized elderly (control group) from physical activity programs for the aged and elderly individuals [10, 11, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25]. This was considered

as a “minor problem” (++) due to the control group may not have similar characteristics to the elderly from nursing homes (case group); as a result, the comparison of the characteristics of the two groups, case and control group, may be compromised. Of the articles included in the qualitative analysis, nine (56.2%) presented a ratio of 1:1 between groups, which is classified as a minor problem (+) [10, 13, 14, 17, 18, 19, 20, 22, 24]. In addition, in relation to the topic “comparable characteristics” evaluated in the qualitative synthesis, 50.0% of the studies (n=8) had major problems (++) [10, 11, 16, 19, 20, 21, 23, 25]. These articles did not match the case group (institutionalized elderly) with the control group (non-institutionalized elderly) regarding age, sex, socioeconomic characteristics and comorbidities.

Ten studies (62.5%) applied the questionnaire through an interview by more than one interviewer [11, 12, 14, 17, 19, 21, 22, 23, 24, 25]. Questionnaire application by means of interview is positive, considering that the participants are aged people. However, having more than one interviewer is negative, as it promotes different results, considering that these articles did not calibrate the interviewers. Therefore, this was considered a minor problem (+). Of the articles included in the qualitative synthesis, 43.75% (n=7) and 56.25% (n=9) had major (++) and minor problems (+), respectively, since the study had confounding factors, such as participants presenting cognitive impairment and/or comorbidities. In addition, the confounding factors and the lack of compatibility of characteristics between the groups were not reduced in data analysis of 13 articles (87.5%), being a major problem (++) [10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 25]. Therefore, the included studies in the qualitative synthesis presented methodological problems that were considered as high risk of bias. In the end, out of 16 eligible articles, one (6.2%) was considered as low risk of bias [20].

Meta-analysis and Certainty of Evidence

Of the 16 included studies, four were not included in the MA due to insuficient data [11, 14, 15, 19], remaining 12 eligible articles for the MA. The results were presented separately for MA:

LEIPAD questionnaire

Two studies were included in this analysis. It could be observed that institutionalized elderly presented lower mean scores (better QoL) than non-institutionalized elderly for 'cognitive functions' and 'depression and anxiety' domains, while NIE presented lower mean scores (better QoL) than institutionalized elderly for 'social functions' and 'sexual functions' domains (Figure 2). These four domains results were classified as having very low certainty of evidence. While institutionalized elderly and non- institutionalized elderly presented similar mean scores (QoL) for 'physical functions', 'self-care skils', 'life satisfaction' and for pooled results (Figure 2 and Table 5), with low, very low, low and very low centainty of evidence, respectively. The GRADE classifications and reasons for each LEIPAD questionnaire domain and pooled results are described in Table 6.

WHOQOL-BREF questionnaire.

Five studies were included in this second MA. Institutionalized elderly and non-institutionalized elderly presented similar mean scores (similar QoL) only for 'general health' domain, with very low certainty of evidence. For all other domains, as well as for pooled results, institutionalized elderly presented lower mean scores (worse QoL) than non- institutionalized elderly – 'physical health', 'psychological health', 'social relationship', 'environmental area', overall (Figure 3 and Table 5). All domains were classified as having very low certainty of evidence, while overall result was classified with low certainty of evidence. Table 7 describes

GRADE classifications and reasons for each WHOQOL-BREF questionnaire domain and pooled results.

WHOQOL-OLD questionnaire.

Two studies were included in this third MA. Institutionalized elderly and non-institutionalized elderly presented similar mean scores for 'death and dying' and 'autonomy' domains with very low certainty of evidence. However, for 'past, present and future activities', 'intimacy', 'social participation' and 'sensory abilities' domains, as well as for pooled results, institutionalized elderly presented lower mean scores (worse QoL) than non-institutionalized elderly (Figure 4 and Table 5). All results were classified having low certainty of evidence. The GRADE classifications and reasons for each WHOQOL-OLD questionnaire domain and pooled results are in Table 8.

SD-36 RAND-36 questionnaire.

Three studies were included in this fourth and last MA. The results indicate that institutionalized elderly presented lower mean scores (worse QoL) than non- institutionalized elderly for 'physical functioning' domain, as well as for pooled results. For all other domains, institutionalized elderly and non- institutionalized elderly presented similar mean scores (similar QoL) – 'general health perceptions', 'role emotional', 'bodily pain', 'mental health', 'social functioning', 'role physical', 'vitality' (Figure 5 and Table 5). All results were classified having very low certainty of evidence. In Table 9, the GRADE classifications and reasons for each SF-36 and RAND-36 questionnaire domain and pooled results are described.

Discussion

The process of population aging is a global phenomenon that must be accompanied by the physical, psychological, social, economic and spiritual well-being of the elderly [6]. As a result of this aging process and the unavailability of family members to care for the elderly, the institutionalization of these individuals has increased [7]. In this sense, the homes for the aged should be able to provide good quality of life for their residents [9]. In contrast, this systematic review summarized that the institutionalization affects the QoL of elderly individuals.

In our systematic review, of 16 studies included, 15 [10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25] were conducted in developing countries, and of these studies, seven were performed in Brazil [11, 14, 15, 16, 19, 21, 25]. In developed nations, the need for nursing homes is reduced due to the care given to the elderly by the State and the family, as well as the high purchasing power of the population that allows the elderly to remain in their homes receiving the health care they need [7, 8]. Moreover, in these countries the institutionalization of the elderly is related to the presence of specific health conditions such as dementia, Alzheimer's disease or cognitive disorders [7]. On the other hand, in the developing countries there is a high rate of institutionalization of the elderly due to cultural, economic and family factors [8]. In this context, identifying differences in QoL of institutionalized older people compared to non-institutionalized ones has been shown to be of interest in studies in developing countries, especially in Brazil.

In the same way, most of the study participants were elderly with 60 years old or more, which is in accordance with the definition by World Health Organization (WHO) and United Nations. Inconsistently, two studies were against this classification [14, 20]. Kuok et al. (2017) and Bonan et al. (2008) included a cut-off level of 50 and 55 years old, respectively. The first study [20] selected 451 participants, of which 248, were residents of nursing homes with a mean age of 78.4 (+/-8.3) years old, and the other 203 were community dwelling elderly, aged 64.1 (+/-6.8) years old. The latter research [14] included elderly aged 70.3 (+/-10.2 years). Both

studies revealed that a small number of participants had less than 60 years and those were not institutionalized [14, 20]. Moreover, no differences have been observed on QoL of elderly from long-term care institutions when compared to community dwelling ones [14, 20], reaffirming that ages <60 years did not compromise their results. Therefore, whereas the sample size of Bonan et al. (2008) was uniquely included in our qualitative assessments (not included in meta-analysis), both studies were kept in this systematic review, not impairing the results.

The effects of aging process with regards to general health perceptions, physical, psychological social and environment domains can be verified by means of QoL questionnaires [6]. Although it is considered a subjective and complex evaluation, the QoL has been extensively studied among elderly, once the perception of life changes during aging process and is influenced by individual's perspectives about life and society [33]. Therefore, some questionnaires have been used to assess HRQoL, as example of Leipad, WHOQOL-BREF, WHOQOL-OLD, SF-36, RAND-36, and OHRQoL as GOHAI.

The Leipad questionnaire comprises of 49 self-assessed items grouped in seven core domains: self-care, physical, cognitive, social and sexual functions, depression and anxiety and life satisfaction [34]. Two eligible studies [10, 24] were submitted to a meta-analysis and identified better QoL in institutionalized elderly, when compared to the non-institutionalized elderly, in the "cognitive functions" and "depression and anxiety". It can be hypothesized that institutionalized elderly accepts and get used to an institutionalized life along time [24]. Since there is an increase on social interaction, communicative activities, and performance of cognitive exercises, depression and anxiety symptoms drastically decrease [10]. All these factors contribute to maintain elderly's cognitive function, which improves QoL [10, 24].

Indeed, when Leipad domains were analysed together, no differences have been found on the QoL of the institutionalized elderly compared to the non-institutionalized. This result may be attributed to the low power of certainty of scientific evidence of the studies [10, 24] due

to the incompatibility between groups in relation to age, gender, socioeconomic conditions and comorbidities, the non-reduction of these characteristic discrepancies on statistical analysis [10] and insufficient sample size [24].

The WHOQOL questionnaire is an international recognized instrument from WHO to evaluate QoL. Besides the extended version (WHOQOL-100) [35], there is an abbreviated (WHOQOL-BREF) [36] and a specific version to evaluate elderly's QoL (WHOQOL-OLD) [37]. The WHOQOL-BREF contains 26 items grouped in four domains: physical, psychological, environmental and social [36], while WHOQOL-OLD comprises of 24 items subdivided into 6 domains: sensorial ability, autonomy, past, present and future activities, social participation, death and dead, intimacy [37].

Regarding meta-analysis using WHOQOL-BREF questionnaire [12, 15, 17, 20, 25], institutionalized elderly presented worse QoL in all domains as well as in the pooled results when compared to the non-institutionalized group. In relation to the physical domain, the differences can be explained by the insufficient promotion of physical activities between elderly in long-term care institutions, or their lack of engagement on social activities, aggravated by serious systemic diseases [13, 15, 20]. These individual health conditions aggravate the sedentary lifestyle, compromising the elderly functional capacity and physical health [20, 25]. Also, the absence of physical activity can lead to the development of depressive symptoms, explaining the worse QoL found in psychological domain for institutionalized elderly when compared to community dwelling ones [20, 25].

Depression is a prevalent disease in institutionalized elderly and a predictor of a worse QoL in social domain [20]. In addition, the physical distance between elderly and family, relatives and friends impair their social life and, consequently, their perception about QoL on the social domain [13, 16, 17], exposing the worse QoL found in institutionalized elderly. Nevertheless, elderly are constantly sheltered against their own desire and do not receive family

visits, contributing to the isolation [16, 25]. Another important aspect that compromises QoL on social domain of institutionalized elderly is the lack of opportunity to accomplish leisure activities, which impacts on social environment and social contact between these individuals [25].

In addition, the absence of socialization is directly related to the deterioration of physical and mental health of institutionalized elderly, accounting for the worse QoL on physical and psychological domains when compared to the community dwelling [25]. Finally, differences on environmental domain describes the negative feeling of elderly concerning the distance from their home, and the difficult to adapt to the new and unfamiliar place of residence [13].

Still, the differences on QoL found between institutionalized and community dwelling elderly must be observed with caution due to the risk of bias and the low certainty of evidence of included studies. Bodur and Cingil (2009), Dagios et al. (2015) and Vitorino et al. (2013) did not paired the age between groups, then institutionalized elderly were older than the non-institutionalized group. However, there is a relation between age increment and declined QoL of elderly on psychological, social and environmental domains [13]. Therefore, the discrepancy of age in that studies [13, 16, 25] may have affected the meta-analysis results.

In addition, WHOQOL-BREF should be used simultaneously with the WHOQOL-OLD when the QoL of elderly people is being evaluated to improve the data collection and get more precise results. Despite this, only one article [16] have adopted both, whereas some authors [13, 15, 17, 20, 25] preferred to apply one of the versions, perhaps as a way to shorten the data collection. Moreover, although the use of WHO questionnaires requires attention to fill all items correctly, of the studies that used WHOQOL-BREF questionnaire, two [17, 25] applied this instrument by more than one interviewer, which could have under or overestimate the answers, which may account to the risk of biased results.

A meta-analysis of the studies that used WHOQOL-OLD questionnaire [16, 23] demonstrated on “past, present and future activities”, “intimacy”, “social participation” and “sensory abilities” domains, as well as for pooled results, worse QoL for the institutionalized elderly than for the non-institutionalized ones. The term "past, present and future activities" refers to the satisfaction with the future, the desired opportunities, and recognition with what has been achieved throughout life [37]. It is known that the great majority of the elderly are not freely institutionalized of their own, but rather by family decision [16]. This finding suggests that the elderly consider that being institutionalized is not what they hoped to have achieved in life, and that there are no opportunities to change this reality [16].

The ‘intimacy’ domain included questions about the sense of fellowship and love in life, and as opportunities to love and be loved. By any means, there is a prevalence of widowed, separated or single institutionalized elderly, that is, they do not have a partner, unlike the community dwelling elderly who are mostly married [17]. This explains the finding that the institutionalized elderly felt less satisfied about the companionship and love received than the non-institutionalized elderly. The satisfaction with the use of time, activity accomplishment and participation in the community are evaluated in the 'social participation' facet [37]. Thus, elderly residing in nursing homes cause a feeling of being prevented from carrying out their projects. This way, distance from family and friends also affects the social relations of these elderly, compromising their QoL in the 'social participation' domain [16].

At least, “sensory abilities” domain refers to the loss of sensory functioning in everyday life and in the ability to interact. In this context, institutionalized older people are more physically and sensorially incapacitated than the elderly living in the community [16, 23], confirming the results. Yet, these results might be interpreted with care, since the studies included in the meta-analysis refers to WHOQOL-OLD questionnaire [16, 23] presented methodological major problems that resulted in low certainty of scientific evidence.

The SF-36 and RAND-36 questionnaires comprises of 36 questions grouped in eight domains: physical functioning, role physical, bodily pain, general health perceptions, role emotional, vitality, mental health and social functioning [38, 49]. Although the SF-36 and Rand-36 instrument were considered a short form tool for health survey, both questionnaires represent a set of generic, coherent, and easily administered quality-of-life measurements [38, 39]. Furthermore, these instruments were used for several studies to assess health related QoL [18, 22, 23].

Considering the equality of the domains and the overall scale of these questionnaires and that they only differ slightly in the scoring method [39], the studies [18, 22, 23] that used SF-36 and RAND-36 questionnaires to evaluated the QoL were grouped in the same meta-analysis, in order to the quantitative synthesis was able to be performed. This meta-analysis demonstrated that the institutionalized elderly presented worse QoL than non-institutionalized elderly for “physical functioning” domain and pooled results. It brings out that the raised prevalence of health problems, such as degenerative joint disease [13], especially in institutionalized elderly limit the performance of physical activities.

However, SF-36 “physical functioning” domain evaluates the performance of vigorous activities that elderly generally cannot execute [40]. Possibly, questions within this domain do not measure accurately the performance of elderly with a poor systemic health [40], which is the case of the institutionalized elderly. All factors may have influenced the results found in the studies using SF-36 questionnaire [18, 22]. In addition, the study of Rachadel et al. (2015) the elderly who lived in nursing homes presented higher mean age than the non-institutionalized. This methodologic problem may affect the findings since the aging process is related to worse QoL of elderly [13].

Apart from the previous findings, the comparation of the OHRQoL between institutionalized elderly and community-dwelling elderly has not been frequently evaluated in

the studies. Instead, only a few reports [11, 14] evaluated OHRQoL and revealed sparse results for institutionalized elderly when compared to the non-institutionalized elderly. Due to insufficient data, the meta-analysis did not include these two studies. Even though, the relevance of oral health conditions must be enhanced in further analysis, as the presence of teeth or prosthetic treatment improves self-steam and increase masticatory functions and, consequently, the elderly QoL [41, 42, 43].

Finally, it is essential to mention the limitations of the present systematic review, especially those concerning the different methodological measurements, the wide range of age, culture and gender found in the included studies. These limitations could be the main reason of the high heterogeneity [28, 31]. Therefore, our outcomes should be carefully observed, as it may not impact the elderly's QoL worldwide. However, although the included studies used different questionnaires to assess the QoL, separate meta-analyzes were performed for each questionnaire [30] and the standardized mean difference was used when the studies measure the QoL in different scales [31]. These procedures were realized in order to minimize risk of bias and try to ensure the accuracy of the results.

The wide range of age could be explained due to most of the included studies were conducted in underdeveloped countries, where the mean age of elderly is lower than in developed countries [3] and the nursing homes do not have an age limit to admit people. Furthermore, the discrepancies of age, gender and culture is inherent to where and how the studies were conducted. Another limitation is the publication bias, which is the tendency of journals to publish positive results over negative evidence [28]. Thus, positive results of institutionalization over elderly's QoL could have been found but never published before, which may bias the outcomes of this systematic review. In order to minimize this bias, we tried to identify unpublished works in SIGLE, in meetings and through contact with experts [28].

Nevertheless, although well-designed primary studies should be conducted to generate robust scientific studies to support the meta-analysis, no other review has been compiled data concerning QoL of institutionalized elderly and non-institutionalized elderly in the literature. Therefore, the outcomes of this study will help on guiding the creation of specific public health policies to the nursing homes. Regarding the low QoL found for institutionalized elderly, it is important to mention that health care must be provided and integrated to social services to ensure that dependent people keep the highest possible QoL [4]. Specialized professionals can be hired to work in nursing homes, according to the needs of each place, such as physical educators, physiotherapists, nutritionists, dentists, psychologists and medical doctors. Moreover, improving caregivers training and the infrastructure conditions guarantee QoL to the residents in physical, psychological, social and environmental aspects, and create an integrated environment where elderly could live with fairness, dignity, participation, respect and autonomy [9].

Conclusion

The institutionalization influences negatively the QoL of the elderly. However, this should be approached with caution, due to the presence of methodological bias in the articles assessed in this systematic review, which consequently resulted in poor quality of evidence. Therefore, further primary and well delineated studies should be accomplished to confirm this evidence.

List of abbreviations

QoL: Quality of Life; PECO: Population, Exposure, Comparison and Outcomes; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis; SIGLE: System for Information on Gray Literature in Europe; VAS: Visual Analogue Scale; MA: Meta-Analysis;

CI: Confidence Interval; GRADE: Grading of Recommendations Assessment, Development and Evaluation; HRQoL: Health-Related Quality of Life; OHRQoL: Oral Health–Related Quality of Life; WHO: World Health Organization.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. All data generated or analysed during this study are included in this published article and its supplementary information files.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

MMDM, TMC, MBM, LCM performed the literature searching. MMDM and TMC have selected the eligible articles, analysed, interpreted data. MBM ran the statistical tests. MMDM and TMC were the major contributors in writing the manuscripts. MBM, LCM, YWC and RCMRG helped during writing and correction of the article. All authors read and approved the final manuscript.

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Tables and Figures

Table 1. Search strategy according to different databases

Database	Search Strategy
PubMed	**#1** ((((((((((((((aged[MeSH Terms]) OR aged[Title/Abstract]) OR elderly[Title/Abstract]) OR ((Aged, 80 and over[MeSH Terms]))) OR (("Aged, 80[Title/Abstract] AND over"[Title/Abstract]))) OR "oldest old"[Title/Abstract]) OR Nonagenarian*[Title/Abstract]) OR Octogenarian*[Title/Abstract]) OR Centenarian*[Title/Abstract]) OR "Old people"[Title/Abstract]) OR "Old person") OR "Elders") OR "Elderly people") OR "Elderly person") OR "Elderly population") OR Seniors[Title/Abstract] **#2** ((((((((((((((((((((((Institutionalization[MeSH Terms]) OR Institutionalized Person*[Title/Abstract]) OR "Person, Institutionalized"[Title/Abstract]) OR Institutionalization*[Title/Abstract]) OR Homes for the Aged[MeSH Terms]) OR "Home, Old Age"[Title/Abstract]) OR "Homes, Old Age"[Title/Abstract]) OR Old Age Home*[Title/Abstract]) OR "Geriatric Long-Term Care Facilities"[Title/Abstract]) OR "Geriatric Long-Term Care Institutions"[Title/Abstract]) OR "Homes for the Aged"[Title/Abstract]) OR Almshouses[MeSH Terms]) OR Almshouse*[Title/Abstract]) OR Poorhouse*[Title/Abstract]) OR Nursing Homes[MeSH Terms]) OR "Homes, Nursing"[Title/Abstract]) OR "Home, Nursing"[Title/Abstract]) OR Nursing Home*[Title/Abstract]) OR Housing for the elderly[MeSH Terms]) OR "Life Care Centers, Retirement"[Title/Abstract]) OR "Continuing Care Retirement Centers"[Title/Abstract]) OR "Housing for the elderly"[Title/Abstract]) OR "Institutionalized older adults"[Title/Abstract]) OR "Institutionalized elderly"[Title/Abstract] **#3** ((((((((((((((Independent living[MeSH Terms]) OR "Living, Independent"[Title/Abstract]) OR "Community Dwelling"[Title/Abstract]) OR "Dwelling, Community"[Title/Abstract]) OR "Dwellings, Community"[Title/Abstract]) OR "Aging in Place"[Title/Abstract]) OR "Independent living"[Title/Abstract]) OR Deinstitutionalization[MeSH Terms]) OR "Deinstitutionalized Persons"[Title/Abstract]) OR "Deinstitutionalized Person"[Title/Abstract]) OR "Persons, Deinstitutionalized"[Title/Abstract]) OR Deinstitutionalization[Title/Abstract]) OR "Non-institutionalized elderly"[Title/Abstract]) OR "Non-institutionalized elders"[Title/Abstract]) OR Non-institutional[Title/Abstract]) OR Community[Title/Abstract] **#4** ((((Quality of Life[MeSH Terms]) OR "Life Quality"[Title/Abstract]) OR "Health Related Quality Of Life"[Title/Abstract]) OR HRQOL[Title/Abstract]) OR "Quality of life"[Title/Abstract] **#1 AND #2 AND #3 AND #4**
Scopus	**#1** TITLE-ABS-KEY(aged) OR TITLE-ABS-KEY(elderly) OR TITLE-ABS-KEY("Oldest Old") OR TITLE-ABS-KEY(Nonagenarian*) OR TITLE-ABS-KEY(Octogenarian*) OR TITLE-ABS-KEY(Centenarian*) OR TITLE-ABS-KEY("aged, 80 over") OR TITLE-ABS-KEY("Old people") OR TITLE-ABS-KEY("old person") OR TITLE-ABS-KEY(elders) OR TITLE-ABS-KEY("elderly people") OR TITLE-ABS-KEY("elderly person") OR TITLE-ABS-KEY("elderly population") OR TITLE-ABS-KEY(seniors) **#2** TITLE-ABS-KEY(Institutionalized AND Person*) OR TITLE-ABS-KEY("Person, Institutionalized") OR TITLE-ABS-KEY(Institutionalization*) OR TITLE-ABS-KEY("Home, Old Age") OR TITLE-ABS-KEY("Homes, Old Age") OR TITLE-ABS-KEY(Old AND Age AND Home*) OR TITLE-ABS-KEY("Geriatric Long-Term Care Facilities") OR TITLE-ABS-KEY("Geriatric Long-Term Care Institutions") OR TITLE-ABS-KEY("Homes for the Aged") OR TITLE-ABS-KEY(Almshouse*) OR TITLE-ABS-KEY(Poorhouse*) OR TITLE-ABS-KEY(Nursing AND Home*) OR TITLE-ABS-KEY("Home, Nursing") OR TITLE-ABS-KEY("Homes, Nursing") OR TITLE-ABS-KEY("Housing for the elderly") OR TITLE-ABS-KEY("Life Care Centers, Retirement") OR TITLE-ABS-KEY("Continuing Care Retirement Centers") OR TITLE-ABS-KEY("Institutionalized older adults") OR TITLE-ABS-KEY("Institutionalized elderly") **#3** TITLE-ABS-KEY("Independent living") OR TITLE-ABS-KEY("Community Dwelling") OR TITLE-ABS-KEY("Dwelling, Community") OR TITLE-ABS-KEY("Dwellings, Community") OR TITLE-ABS-KEY("Aging in Place") OR TITLE-ABS-KEY(Deinstitutionalization) OR TITLE-ABS-KEY("Deinstitutionalized Persons") OR TITLE-ABS-KEY("Deinstitutionalized Person") OR TITLE-ABS-KEY("Persons, Deinstitutionalized") OR TITLE-ABS-KEY("Independent living") OR TITLE-ABS-KEY("Non-institutionalized elderly") OR TITLE-ABS-KEY("Non-institutionalized elders") OR TITLE-ABS-KEY(non-institutional) OR TITLE-ABS-KEY(community)

	#4 TITLE-ABS-KEY(“Quality of Life”) OR TITLE-ABS-KEY(“Life Quality”) OR TITLE-ABS-KEY(“Health Related Quality of Life”) OR TITLE-ABS-KEY(HRQOL) **#1 AND #2 AND #3 AND #4**
Web of Science	**#1** TS=(aged OR elderly OR “Oldest Old” OR Nonagenarian* OR Octogenarian* OR Centenarian* OR “Aged, 80 and over” OR “Old people” OR “old person” OR elders OR “elderly people” OR “elderly person” OR “elderly population” OR seniors) **#2** TS=(Institutionalized Person* OR “Person, Institutionalized” OR Institutionalization OR Institutionalization* OR “Home, Old Age” OR “Homes, Old Age” OR Old Age Home* OR “Geriatric Long-Term Care Facilities” OR “Geriatric Long-Term Care Institutions” OR “Homes for the Aged” OR “Homes for the Aged” OR Almshouses OR Almshouse* OR Poorhouse* OR “Nursing Homes” OR Nursing Home* OR “Home, Nursing” OR “Homes, Nursing” OR “Housing for the elderly” OR “Life Care Centers, Retirement” OR “Continuing Care Retirement Centers” OR “Institutionalized older adults” OR “Institutionalized elderly”) **#3** TS=(“Independent living” OR “Living, Independent” OR “Community Dwelling” OR “Dwelling, Community” OR “Dwellings, Community” OR “Aging in Place” OR Deinstitutionalization OR “Deinstitutionalized Persons” OR “Deinstitutionalized Person” OR “Persons, Deinstitutionalized” OR Deinstitutionalization OR “Independent living” OR “Non-institutionalized elderly” OR “Non-institutionalized elders” OR “non-institutional” OR community) **#4** TS=(“Quality of Life” OR “Life Quality” OR “Health Related Quality Of Life” OR HRQOL) **#1 AND #2 AND #3 AND #4**
Cochrane Library	#1 MeSH descriptor: [Aged] explode all trees 1640 #2 aged OR elderly OR "Oldest Old" OR Nonagenarian* OR Octogenarian* OR Centenarian* 430102 #3 MeSH descriptor: [Aged, 80 and over] explode all trees 262 #4 "Aged, 80 and over" OR "Old people" OR "old person" OR elders OR "elderly people" OR "elderly person" OR "elderly population" OR seniors 52836 #5 #1 OR #2 OR #3 OR #4 430609 #6 MeSH descriptor: [Institutionalization] explode all trees 200 #7 Institutionalization* OR Institutionalized Person* OR "Person, Institutionalized" 794 #8 MeSH descriptor: [Homes for the Aged] explode all trees 556 #9 "Homes for the Aged" OR "Home, Old Age" OR "Homes, Old Age"OR Old Age Home* OR "Geriatric Long-Term Care Facilities"OR "Geriatric Long-Term Care Institutions" 0 #10 MeSH descriptor: [Almshouses] explode all trees 0 #11 Almshouse* OR Poorhouse* 2 #12 MeSH descriptor: [Nursing Homes] explode all trees 1189 #13 Nursing Home* OR "Home, Nursing" OR "Homes, Nursing" 6599 #14 MeSH descriptor: [Housing for the Elderly] explode all trees 35 #15 "Housing for the elderly" OR "Care Centers, Retirement" OR "Continuing Care Retirement Centers" OR "Institutionalized older adults" OR "Institutionalized elderly" 352 #16 #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 1302402 #17 MeSH descriptor: [Independent Living] explode all trees 267 #18 "Independent living" OR "Living, Independent" OR "Community Dwelling" OR "Dwelling, Community" OR "Dwellings, Community" OR "Aging in Place" 3417 #19 MeSH descriptor: [Deinstitutionalization] explode all trees 22 #20 Deinstitutionalization OR "Deinstitutionalized Persons" OR "Deinstitutionalized Person" OR "Persons, Deinstitutionalized" OR "Non-institutionalized elderly" OR "Non-institutionalized elders" OR "non-institutional" OR community 37791 #21 MeSH descriptor: [Quality of Life] explode all trees 20225 #22 "Quality of Life" OR "Life Quality" OR "Health Related Quality Of Life" OR HRQOL 72184 #23 #17 OR #18 OR #19 OR #20 38098 #24 #21 OR #22 72184 #25 #5 AND #16 AND #23 AND #24 3450
Lilacs	**#1** (mh:(aged)) OR (tw:(aged)) OR (tw:(elderly)) OR (tw:(“Oldest Old”)) OR (tw:(Nonagenarian$)) OR (tw:(Octogenarian$)) OR (tw:(Centenarian$)) OR (mh:(“Aged, 80 and over”)) OR (tw:(“Aged, 80 and over”)) OR (tw:(“Old people”)) OR (tw:(“old person”)) OR (tw:(elders)) OR (tw:(“elderly people”)) OR (tw:(“elderly person”)) OR (tw:(“elderly population”)) OR (tw:(seniors)) **#2** (tw:(Institutionalized Person$)) OR (tw:("Person, Institutionalized")) OR (mh:("Institutionalization")) OR (tw:(Institutionalization$)) OR (tw:("Home, Old Age")) OR (tw:("Homes, Old Age")) OR (tw:(Old Age Home$)) OR (tw:("Geriatric Long-Term Care Facilities")) OR (tw:("Geriatric Long-Term Care Institutions")) OR (tw:("Homes for the Aged")) OR (tw:("Homes for the Aged")) OR (mh:("Almshouses")) OR (tw:(Almshouse$)) OR (tw:(Poorhouse$)) OR

	(mh:("Nursing Homes")) OR (tw:(Nursing Home$)) OR (tw:("Home, Nursing")) OR (tw:("Homes, Nursing")) OR (mh:("Housing for the elderly")) OR (tw:("Housing for the elderly")) OR (tw:("Life Care Centers, Retirement")) OR (tw:("Continuing Care Retirement Centers")) OR (tw:("Institutionalized older adults")) OR (tw:("Institutionalized elderly")) **#3** (mh:(Independent living)) OR (tw:("Independent living")) OR (tw:("Living, Independent")) OR (tw:("Community Dwelling")) OR (tw:("Dwelling, Community")) OR (tw:("Dwellings, Community")) OR (tw:("Aging in Place")) OR (mh:(Deinstitutionalization)) OR (tw:(Deinstitutionalization)) OR (tw:("Deinstitutionalized Persons")) OR (tw:("Deinstitutionalized Person")) OR (tw:("Persons, Deinstitutionalized")) OR (mh:(Deinstitutionalization)) OR (tw:(Deinstitutionalization)) OR (mh:("Non-institutionalized elderly")) OR (tw:("Non-institutionalized elders")) OR (tw:("non-institutional")) OR (tw:(community)) **#4** (mh:("Quality of Life")) OR (tw:("Quality of Life")) OR (tw:("Life Quality")) OR (tw:("Health Related Quality Of Life")) OR (tw:(HRQOL)) **#1 AND #2 AND #3 AND #4**
Open Grey	**#1** (aged OR elderly OR "Oldest Old" OR Nonagenarian* OR Octogenarian* OR Centenarian* OR "Aged, 80 and over" OR "Old people" OR "old person" OR elders OR "elderly people" OR "elderly person" OR "elderly population" OR seniors) **#2** (Institutionalized Person* OR "Person, Institutionalized" OR Institutionalization OR Institutionalization* OR "Home, Old Age" OR "Homes, Old Age" OR Old Age Home* OR "Geriatric Long-Term Care Facilities" OR "Geriatric Long-Term Care Institutions" OR "Homes for the Aged" OR "Homes for the Aged" OR Almshouses OR Almshouse* OR Poorhouse* OR "Nursing Homes" OR Nursing Home* OR "Home, Nursing" OR "Homes, Nursing" OR "Housing for the elderly" OR "Life Care Centers, Retirement" OR "Continuing Care Retirement Centers" OR "Institutionalized older adults" OR "Institutionalized elderly") **#3** ("Independent living" OR "Living, Independent" OR "Community Dwelling" OR "Dwelling, Community" OR "Dwellings, Community" OR "Aging in Place" OR Deinstitutionalization OR "Deinstitutionalized Persons" OR "Deinstitutionalized Person" OR "Persons, Deinstitutionalized" OR Deinstitutionalization OR "Independent living" OR "Non-institutionalized elderly" OR "Non-institutionalized elders" OR "non-institutional" OR community) **#4** ("Quality of Life" OR "Life Quality" OR "Health Related Quality Of Life" OR HRQOL) **#1 AND #2 AND #3 AN** **D #4**

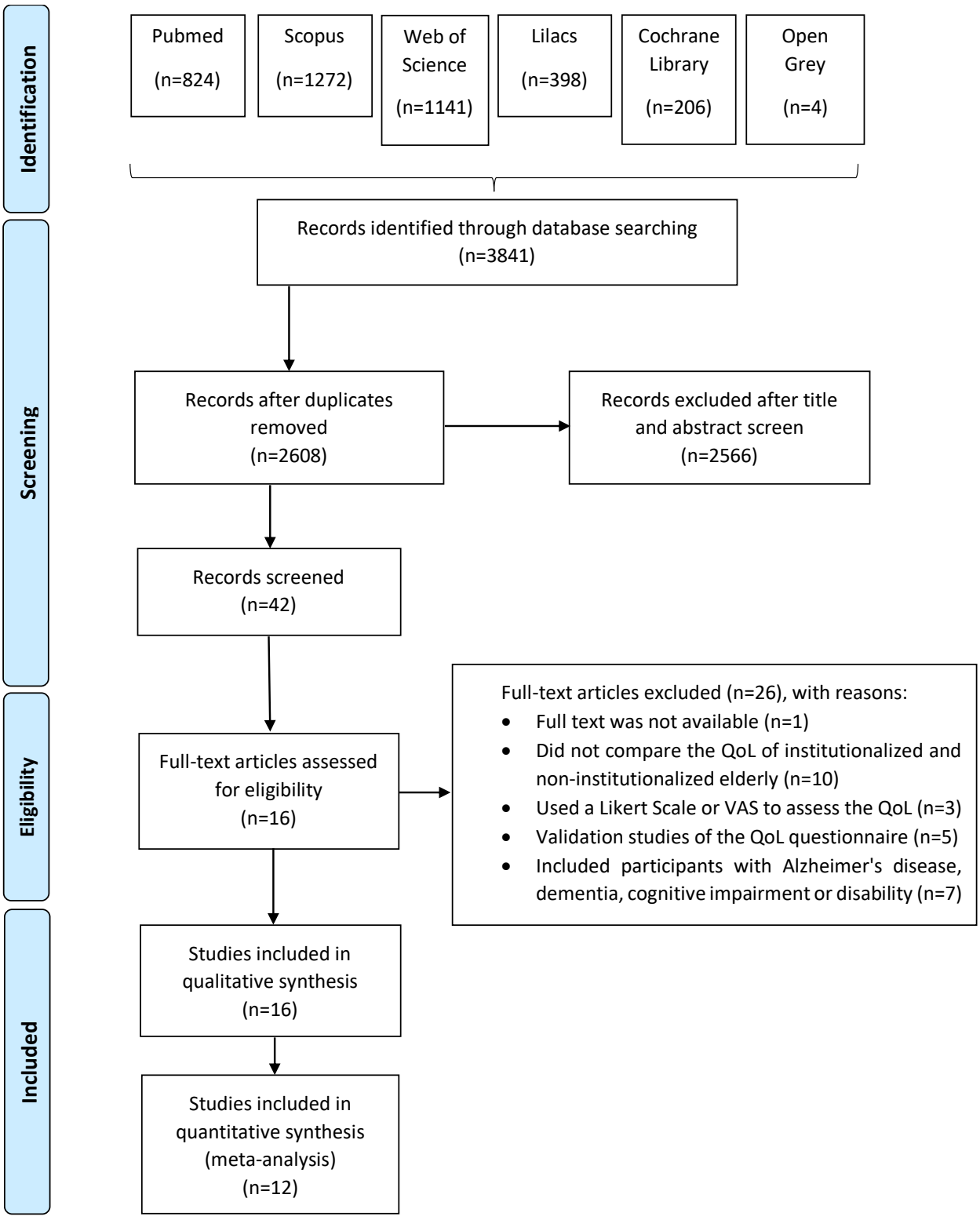

Figure 1. PRISMA flow diagram of literature searches.

Table 2. Data collection of the eligible articles.

Authors, year (local)	Study Design	Sample size	Sample characteristics	Data collection	Results
Urciuoli et al., 1998 **(Italy)**	Cross-sectional	Convenience sample (n= 66, being 29 IE and 37 NIE)	IE=4 male and 25 females; NIE=6 male and 31 females Age: >88 years	**LEIPAD** (The lower the scores, the better the QoL) **Scale: 0-93 points**	Physical functions: IE: mean=7.20, SD=1.91; NIE: mean=6.55, SD=2.37 (p>0.05, Student's T-test) Self-care skills: IE: mean=12.86, SD=3.39; NIE: mean=10.45, SD=5.58 (**p<0.05**, Student's T-test) Cognitive functions: IE: mean=4.50, SD=2.08; NIE: mean=4.74, SD=2.91 (p>0.05, Student's T-test) Depression and anxiety: IE: mean=1.79, SD=2.42; NIE: mean=2.23, SD=2.17 (p>0.05, Student's T-test) Social functions: IE mean=3.48, SD=1.80; NIE: mean=2.79, SD=1.93 (p>0.05, Student's T-test) Sexual functions: IE mean=6.00, SD=0.00; NIE: mean=6.00, SD=0.00 (p>0.05, Student's t test) Life Satisfaction: IE mean=4.75, SD=2.31; NIE: mean=5.52, SD=2.83 (p>0,05, Student's T-test)
Akça; Sahin, 2008 **(Turkey)**	Cross-sectional	Convenience sample (n= 251, being 90 IE and 124 NIE)	IE=52 male and 38 females; NIE=87 male and 37 females Age: ≥ 60 years	**LEIPAD** (The lower the scores, the better the QoL) **Scale: 0-93 points**	Physical functions: IE mean=12.70, SD=2.67; NIE: mean=12.46, SD=2.51 (p>0.05, Student's T-test) Self-care skills: IE mean=9.63, SD=4.76; NIE: mean=10.28, SD=5.00 (p>0.05, Student's T-test) Cognitive functions: IE mean=11.28, SD=2.39; NIE: mean=12.04, SD=2.43 (**p<0.05**, Student's T-test) Depression and anxiety: IE mean=9.14, SD=2.95; NIE: mean=9.94, SD=3.29 (p>0.05, Student's T-test) Social functions: IE mean=7.94, SD=1.91; NIE: mean=7.21, SD=2.28 (**p<0.05**, Student's T-test) Sexual functions: IE mean=7.43, SD=1.25; NIE: mean=6.33, SD=1.50 (**p<0.05**, Student's T-test) Life Satisfaction: IE mean=17.19, SD=2.66; NIE: mean=16.90, SD=3.20 (p>0.05, Student's T-test)

Bonan et al., 2008 **(Brazil)**	Cross-sectional	Convenience Sample (n=90, being 45 IE and 45 NIE)	IE=22 male and 23 females; NIE=20 male and 25 females Age: >55 years	**GOHAI** (The higher the scores, the better the QoL) **Scale: 0-60 points**	IE: mean=50, SD=8; NIE: mean=50, SD= 6 (p>0.05, Student's T-test)
Bodur; Cingil, 2009 **(Turkey)**	Cross-sectional	Convenience Sample (n=74, being 37 IE and 37 NIE)	IE=60% male and 40% females; NIE=38% male and 62% females Age: >60 years	**WHOQOL-BREF** (The higher the scores, the better the QoL) **Scale: 0-100 points**	General Health: IE: mean=71.9, SD=20.4; NIE: mean=65.1, SD=18.8 (p>0.05, Student's T-test) Physical Health: IE: mean=62.2, SD=29.7; NIE: mean=58.1, SD= 22.3 (p>0.05, Student's T-test) Psychological Health: IE: mean=66.2, SD=24.7; NIE: mean=63.1, SD=20.3 (p>0.05, Student's T-test) Social relationship: IE: mean=58.1, SD=23.7; NIE: mean=73.9, SD=23.0 (**p<0.05**, Student's T-test) Environmental area: IE: mean=66.5, SD=17.2; NIE: mean=75.9, SD=17.9 (**p<0.05**, Student's T-test)
Alcarde et al., 2010 **(Brazil)**	Cross-sectional	Convenience Sample (n=137, being 90 IE and 47 NIE)	IE=68 male and 69 females; NIE=68 male and 69 females Age: 60 to 92 years	**GOHAI** (The higher the scores, the better the QoL) **Scale: 0-60 points**	IE: median ≤28 (n=55, 61.1%) and >28 (n=35, 38.9%); NIE: median ≤28 (n=18, 38.3%) and >28 (n=29, 61.7%) (**p<0.05**, Chi-square test)
Bodner et al., 2011 **(Israel)**	Cross-sectional	Convenience Sample (n=126, being 32 IE and 94 NIE)	IE=33.4% male and 65.6% females; NIE=47.8% male and 52.2% females Age: >64 years	**SF-36** (The higher the scores, the better the QoL) **Scale: 0-100 points**	The 'general health perceptions', 'physical functioning', 'physical role functioning', 'bodily pain', 'vitality' and 'emotional role functioning' did not show significant difference between the IE and NIE Mental Health: IE: mean=51.23, SD=29.82; NIE: mean=79.45, SD= 12.78 (**p<0.05**, MANCOVA) Social Functioning: IE: mean=94.94, SD=22.54; NIE: mean=76.70, SD=20.09 (**p<0.05**, MANCOVA)

Ramos et al., 2012 (South Africa)	Cross-sectional	Convenience sample (n= 284, being 73 IE and 175 NIE)	Distribution according sex not informed Age: >60 years	**WHOQOL-OLD** (The higher the scores, the better the QoL) **Scale: 0-100 points**	Sensorial abilities: IE: mean=40, SD=15.1; NIE: mean=50.2, SD=14.2 (**p<0.05**, Student's t test) Autonomy: IE: mean=28.3, SD=16.5; NIE: mean=36.5, SD=20.9 (p>0.05, Student's t test) Past, present and future activities: IE: mean=38.5, SD=15.2; NIE: mean=52.6, SD=13.4 (**p<0.05**, Student's t test) Death and dying: IE: mean=61.2, SD=15.7; NIE: mean=72.6, SD=15.2 (p<0.05, Student's t test) Social participation: IE: mean=63.6, SD=17.1; NIE: mean=76.2, SD=16.1 (**p<0.05**, Student's t test) Intimacy: IE: mean=57.3, SD=21.7; NIE: mean=74.7, SD=21.7 (**p<0.05**, Student's t test)
Vitorino et al., 2013 (Brazil)	Cross-sectional	Convenience sample (n= 354, being 66 IE and 288 NIE)	IE=38 male and 38 females; NIE=94 male and 194 females Age: 60 to 80 or older	**WHOQOL-BREF** (The higher the scores, the better the QoL) **Scale: 0-100 points**	General Health: IE: mean= 69.83, SD=19.18; NIE: mean= 69.81, SD=19.01 (p>0.05, Student's t test) Physical Health: IE: mean=63.6, SD=22.14; NIE: mean=68.61, SD=18.26 (p>0.05, Student's t test) Psychological Health: IE: mean=65.19, SD=17.62; NIE: mean=69.69, SD=15.33 (**p<0.05**, Student's t test) Social relationship: IE: mean=67.87, SD=20.31; NIE: mean=75.10, SD=17.27 (**p<0.05**, Student's t test) Environmental area: IE: mean= 66.20, SD=15.42; NIE: mean=65.09, SD=16.19 (p>0.05, Student's t test)
Even-Zohar, 2014 (Israel)	Cross-sectional	Convenience Sample (n=115, being 60 IE and 55 NIE)	IE=20 male and 40 females; NIE=23 male and 32 females Age: IE: mean=74.7 and NIE: mean=75.8	**WHOQOL-BREF** (The higher the scores, the better the QoL) **Scale: 0-20 points**	Physical health: IE: mean=3.06, SD=0.457; NIE: mean=3.70, SD=0.623. (**p<0.05**, Multivariate analysis of covariance) Psychological health: IE: mean=3.03, SD= 0.42; NIE: mean=3.82, SD= 0.57 (**p<0.05**, Multivariate analysis of covariance) Social relationship: IE: mean=2.90, SD=0.81; NIE: mean=4.06, SD=0.62 (**p<0.05**, Multivariate analysis of covariance) Environmental area: IE: mean=2.96, SD=0.46; NIE mean=3.85, SD=0.57 (**p<0.05**, Multivariate analysis of covariance)

Khoury; Sá-Neves, 2014 (Brazil)	Cross-sectional	Convenience Sample (n=66, being 33 IE and 33 NIE)	IE=13 male and 20 females; NIE=8 male and 25 females Age: 60 to 96 years	**WHOQOL-OLD** (The higher the scores, the better the QoL) **Scale: 0-100 points**	Sensory Abilities: IE: mean= 27.86; NIE: mean= 39.14 (**p<0.05**, Mann-Whitney test) Autonomy: IE: mean= 26.76; NIE: mean= 40.24 (**p<0.05**, Mann-Whitney test) Past, present and future activities: IE: mean= 27.95; NIE: mean= 39,05 (**p<0.05**, Mann-Whitney test) Death and dying: IE: mean= 33.17; NIE mean= 33.83 (p>0.05, Mann-Whitney test) Social participation: IE: mean= 28.17; NIE: mean= 38.83 (**p<0.05**, Mann-Whitney test) Intimicy: IE: mean= 27.48; NIE: mean= 39.52 (**p<0.05**, Mann-Whitney test)
Dagios et al., 2015 (Brazil)	Cross-sectional	Convenience Sample (n=136, being 36 IE and 100 NIE)	IE=25 male and 11 females; NIE=37 male and 63 females Age: > 60 years	**WHOQOL-BREF and WHOQOL-OLD** (The higher the scores, the better the QoL) **Scale: 0-20 points**	**WHOQOL-BREF** General Health: IE: mean=10.17, SD=3.04; NIE: mean=14.06, SD=3.84 (**p<0.05**, Student's T-test) Physical Health: IE: mean=10.08, SD=3.32; NIE: mean=14.61, SD=2.73 (**p<0.05**, Student's T-test) Psychological Health: IE: mean=11.35, SD=2.65; NIE: mean=16.02, SD=2.54 (**p<0.05**, Student's T-test) Social relationship: IE: mean=10.67, SD=3.12; NIE: mean=15.28, SD=2.66 (**p<0.05**, Student's T-test) Environmental area: IE: mean=10.64, SD=1.73; NIE: mean=12.88, SD=2.08 (**p<0.05**, Student's T-test) **WHOQOL-OLD** Sensory Abilities: IE: mean=11.00, SD=3.06; NIE: mean=15.69, SD=3.26 (**p<0.05**, Student's T-test) Autonomy: IE: mean=9.21, SD=2.53; NIE: mean=14.69, SD=2.04 (**p<0.05**, Student's T-test) Past, Present and Future Activities: IE: mean=9.64, SD=3.0; NIE: mean=15.12, SD=2.65 (**p<0.05**, Student's T-test) Death and dying: IE: mean=14.21, SD=3.14; NIE: mean=14.69, SD=3.07 (p>0.05, Student's T-test) Social Participation: IE: mean=9.30, SD=3.64; NIE: mean=14.93, SD=2.80 (**p<0.05**, Student's T-test) Intimicy: IE: mean=10.22, SD=2.85; NIE: mean=15.52, SD=3.59 (**p<0.05**, Student's T-test)

Rachadel et al., 2015 (Brazil)	Cross-sectional	Convenience sample (n= 61, being 21 IE and 40 NIE)	Distribution according sex not informed Age: >60 years	**SF-36** (The higher the scores, the better the QoL) **Scale: 0-100 points**	Physical functioning: IE: mean=35.9, SD=25.9; NIE-Active: mean=78, SD=19.6; NIE-Not-Active: mean=51, SD=27.3 (**p<0.05**, Kruskal-Wallis) Role physical: IE: mean=79.7, SD=33.1; NIE-Active: mean=62.5, SD=39.3; NIE-Not-Active: mean=52.5, SD=41.2 (p>0.05, Kruskal-Wallis) Bodily pain: IE: mean=83.2, SD=21.6; NIE-Active: mean=61.4, SD=25.9; NIE-Not-Active: mean=54.4, SD=33.3 (**p<0.05**, Kruskal-Wallis) General Health Perceptions: IE: mean=68.1, SD=20.5; NIE-Active: mean=68.4, SD=22.2; NIE-Not-Active: mean=58.7, SD=29.9 (p>0.05, Kruskal-Wallis) Role Emotional: IE: mean=87.3, SD=12.8; NIE -Active: mean=73.3, SD=35.2; NIE-Not-Active: mean=76.6, SD=34.3 (p>0.05, Kruskal-Wallis) Vitality: IE: mean=70.7, SD=12.4; NIE-Active: mean=69.7, SD=19.7; NIE-Not-Active: mean=66.0, SD=23.4 (p>0.05, Kruskal-Wallis) Mental health: IE: mean=78.1, SD=24.2; NIE -Active: mean=77.2, SD=19.6; NIE-Not-Active: mean=69, SD=27.9 (p>0.05, Kruskal-Wallis) Social functioning: IE: mean=95.8, SD=4.4; NIE-Active: mean=85, SD=23.5; NIE-Not-Active: mean=78.7, SD=30.6 (p>0.05, Kruskal-Wallis)
Cucato et al., 2016 (Brazil)	Cross-sectional	Convenience Sample (n=496, being 99 IE and 387 NIE)	IE=24 male e 75 females; NIE=Living with family: 110 male and 170 females, Living alone: 42 male and 75 females Age: >65 years	**WHOQOL-BREF** (The higher the scores, the better the QoL) **Scale: 0-20 points**	Institutionalized elderly men presented higher scores in physical domains compared to non-institutionalized elderly men that lives alone (**p<0.05**, ANOVA). The scores in all domains (physical, psychological, relationship, and environment) were similar among the three groups (**p<0.05**, ANOVA)

Herazo-Beltrán et al., 2017 (Colombia)	Cross-sectional	Convenience Sample (n=245, being 113 IE and 132 NIE)	IE=48 male and 65 females; NIE=56 male and 75 females Age: Not informed	**SF-36** (The higher the scores, the better the QoL) **Scale: 0-100 points**	Physical Functioning: IE mean=49.5, SD=30.4; NIE: mean=75.4, SD=25.6 (**p<0.05**, Student's T-test) Role physical: IE mean=35.8, SD=40.6; NIE: mean=57.2, SD=40.5 (**p<0.05**, Student's T-test) Bodily Pain: IE mean=62.5, SD=30.1; NIE: mean=69.1, SD=27.3 (p>0.05, Student's T-test) General Health Perceptions: IE mean= 58.2, SD=21.3; NIE: mean=59.5, SD=18.6 (p>0.05, Student's T-test) Role Emotional: IE mean=45.1, SD=43.1; NIE: mean=61.6, SD=43.4 (**p<0.05**, Student's T-test) Vitality: IE mean= 64.1, SD=23.8; NIE: mean=68.1, SD=19.2 (p>0.05, Student's T-test) Mental Health: IE mean=64.8, SD=22.8; NIE: mean=68.6, SD=24.5 (p>0.05, Student's T-test) Social Functioning: IE mean= 69.9, SD=24.8; NIE: mean=75.7, SD=23.1 (p>0.05, Student's T-test)
Kuok et al., 2017 (China)	Cross-sectional	Randomly selected (n=451, being 248 IE and 203 NIE)	IE=35 male and 213 females; NIE=61 male and 142 females Age: ≥50 years	**WHOQOL-BREF** (The higher the scores, the better the QoL) **Scale: 0-20 points**	Physical Health: IE: mean=13.0, SD=2.6; NIE: mean=14.6, SD=2.2 (p>0.05, ANCOVA) Psychological Health: IE: mean=13.2, SD=2.4; NIE: mean=14.6, SD=2.2 (p>0.05, ANCOVA) Social relationship: IE: mean=14.0, SD=2.6; NIE: mean=14.4, SD=2.3 (p>0.05, ANCOVA) Environmental area: IE: mean=13.5, SD= 2.0; NIE: mean=13.7, SD=2.0 (p>0,05, ANCOVA)

Ramocha et al., 2017 (South Africa)	Cross-sectional	Convenience sample (n= 80, being 40 IE and 40 NIE)	IE=23 male and 17 females; NIE=0 male and 40 females Age: 60 to 90 years	**RAND-36** (The higher the scores, the better the QoL) **Scale: 0-100 points**	Physical functioning: IE: mean=74.7, SD=29.6; NIE: mean=81.1, SD=22.9 (p>0.05, Student's t test) Role physical: IE: mean=61.2, SD=47.3; NIE: mean=68.1, SD=44.2 (p>0.05, Student's t test) Bodily pain: IE: mean=66.7, SD=28.9; NIE: mean=73.8, SD=26.4 (p>0.05, Student's t test) General Health Perceptions (General Health): IE: mean=66.1, SD=20; NIE: mean=73.0, SD=18.9 (p>0.05, Student's t test) Role Emotional: IE: mean=59.1, SD=46.2; NIE: mean=74.1, SD=42.3 (p>0.05, Student's t test) Vitality (Energy and Fatigue): IE: mean=66.3, SD=20.5; NIE: mean=79.5, SD=19.1 (**p<0.05**, Student's t test) Mental Health (Emotional well-being): IE: mean=73.9, SD=19.0; NIE: mean=86.8, SD=13.1 (**p<0.05**, Student's t test) Social functioning: IE: mean=68.9, SD=21.4; NIE: mean=77.1, SD=20.5 (p>0.05, Student's t test)

Notes: IE: Institutionalized Elderly; NIE: Non-Institutionalized Elderly; SD: Standard Deviation.

Table 3. Fowkes and Fulton criteria classification determined by the authors.

		Classification		
Guideline	**Checklist**	**0**	**+**	**++**
Study sample representative?	**Source of sample**	Included many long-term institutions for elderly	Included a single long-term institution for elderly, but it was the unique on local	Included a single long-term institution for elderly, even with more institutions to be included
	Sampling method	Random sample	Convenience sample, but it was a cense	Convenience sample and not a cense
	Sample size	High power of study (equal or greater than 80%)	Median power of study (between 75% and 80%)	Low power of study (lower than 75%)
	Entry criteria/ exclusions	inclusion and exclusion criteria well defined, namely, presented both criteria	Inclusion and exclusion criteria not well defined, namely, presented only one of them	No criteria presented
	Non-respondents	Response rate of 100%	Response rate between 80% and 99%	Response rate lower than 80%
Control group acceptable?	**Definition of controls**	Well-defined control (adequate to the aim of the study)	Control group not well defined (inadequate to the aim of the study)	Control group not defined
	Source of controls	Control group from the same city of IE and/or with comparable characteristics	Control group came from different locations (non-comparable characteristics) and/or physical activities programs, elderly group, etc.	Did not mention where the control group came from
	Matching/ randomisation	Case-control relation: 1:2; 1:3, etc	Case-control relation: 1:1	Case-control relation: 2:1; 3:1, etc
	Comparable characteristics	Paired by age, gender, socioeconomical characteristics and comorbidity	Paired by only one of the criteria: age, gender, socioeconomical characteristics or comorbidity	Not paired
Quality of measurements and outcomes?	**Validity**	Used a questionnaire validated and adapted to the target language and population and/or with a good Cronbach's alpha	Used a questionnaire validated but not adapted to the target language and population and/or with a good Cronbach's alpha	Did not use a questionnaire validated and adapted to the target language and population and/or with a good Cronbach's alpha
	Reproducibility	Used a validated questionnaire and performed kappa test, repeatability of measures and/or checking of measures	Used a validated questionnaire, but did not performed kappa test, repeatability of measurements and/or checking of measurements; or did not use a validated questionnaire, but did kappa test, repeatability of measurements and/ or checking of measurement	Did not used a validated questionnaire and did not perform kappa test, test and retest, etc
	Blindness	NA	NA	NA

	Quality control	Single interviewer questionnaire research	Interview questionnaire, applied by many researchers	Self-applied questionnaire
Completeness?	**Compliance**	NA	NA	NA
	Drop outs	NA	NA	NA
	Deaths	NA	NA	NA
	Missing data	No loss	Up to 20% of loss	More than 20% of loss
Distorting influences?	**Extraneous treatments**	NA	NA	NA
	Contamination	NA	NA	NA
	Changes over time	NA	NA	NA
	Confounding factors	No confounding factors	Some confounding factor (cognitive capacity or comorbidity)	Many confounding factors (cognitive capacity, comorbidity, etc)
	Distortion reduced by analysis	All confounding factors were reduced in data analysis	Some confounding factors were reduced in data analysis	Confounding factors were not reduced in data analysis

Notes: 0: No problem; +: Minor problem; ++: Major problem; NA: Not Applicable.

Table 4. Eligible articles quality assessment, following Fowkes and Fulton guidelines.

Guideline	Checklist	Urciuoli et al., 1998	Akça; Sahin, 2008	Bonan et al., 2008	Bodur; Cingil, 2009	Alcarde et al., 2010	Bodner et al., 2011	Ramos et al., 2012	Vitorino et al., 2013	Even-Zohar, 2014	Khoury; Sá-Neves, 2014	Dagios et al., 2015	Rachadel et al., 2015	Cucato et al., 2016	Herazo-Beltrán et al., 2017	Kuok et al., 2017	Ramocha et al., 2017
Study design appropriate to objectives?	Cross-sectional	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Cohort	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Controlled trial	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Case control	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Study sample representative?	Source of sample	0	0	0	+	++	0	0	0	0	0	++	0	0	0	0	0
	Sampling method	++	++	++	++	++	++	++	++	++	++	++	++	++	++	+	0
	Sample size	++	0	++	0	++	0	0	++	0	++	0	0	0	0	0	++
	Entry criteria/ exclusions	+	++	+	++	++	+	+	+	++	+	+	+	+	+	+	0
	Non-respondents	0	0	0	0	0	+	0	0	0	0	++	0	0	0	+	0
Control group accetable?	Definition of controls	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Source of controls	+	+	+	+	+	0	+	+	+	+	+	+	+	+	0	+
	Matching / randomisation	+	+	+	+	++	0	0	0	+	+	0	0	0	+	+	+
	Comparable characteristics	+	++	+	+	++	+	++	++	+	++	++	++	+	+	++	+
Quality of measurements and outcomes?	Validity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reproducibility	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+
	Blindness	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Quality control	+	++	+	0	+	+	+	+	+	+	0	+	0	0	0	+

Completeness?	Compliance	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Drop outs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Deaths	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Missing data	0	0	0	0	0	+	0	0	0	0	++	0	0	0	+	0
Distorting influences?	Extraneous treatments	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Contamination	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes over time	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Confounding factors	+	++	+	+	++	+	++	++	+	++	++	++	+	+	+	+
	Distortion reduced by analysis	++	++	++	++	++	++	++	++	0	++	++	++	++	++	0	++
Summary questions	Bias	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes
	Confounding	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
	Chance	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes

Notes: 0: No problem; +: Minor problem; ++: Major problem; NA: Not Applicable.

Table 5. Numerical results according questionnaire and respective domains and polled results.

Questionnaire	Questionnaire domain		p-value	I^2
LEIPAD	cognitive functions	SMD -0.26 [-0.50, -0.02]	**0.03**	0%
	depression and anxiety	SMD -0.24 [-0.48, -0.00]	**0.05**	0%
	social functions	SMD 0.35 [0.11, 0.59]	**0.004**	0%
	sexual functions	SMD 0.78 [0.50, 1.06]	**<0.00001**	NA
	physical functions	SMD 0.14 [-0.10, 0.38]	0.25	0%
	self-care skils	SMD 0.15 [-0.47, 0.77]	0.63	79%
	life satisfaction	SMD 0.06 [-0.37, 0.48]	0.79	0%
	pooled results	SMD 0.11 [-0.10, 0.32]	0.31	76%
WHOQOL-OLD	death and dying	SMD -0.46 [-1.04, 0.11]	0.11	83%
	autonomy	SMD -1.45 [-3.49, 0.60]	0.17	98%
	past, present and future activities	SMD -1.48 [-2.44, -0.52]	**0.002**	92%
	intimacy	SMD -1.15 [-1.88, -0.43]	**0.002**	88%
	social participation	SMD -1.29 [-2.34, -0.24]	**0.02**	94%
	sensory abilities	SMD -1.06 [-1.80, -0.33]	**0.005**	88%
	pooled results	SMD -1.13 [-1.47, -0.80]	**<0.00001**	91%
WHOQOL-BREF	general health	SMD -0.24 [1.00, 0.52]	0.54	92%
	physical health	SMD -0.69 [-1.17, -0.22]	**0.004**	91%
	psychological health	SMD -0.82 [-1.40, -0.24]	**0.006**	94%
	social relationship	SMD -0.88 [-1.46, -0.29]	**0.003**	94%
	environmental area	SMD -0.66 [-1.26, -0.07]	**0.03**	94%
	pooled results	SMD -0.70 [-0.94, -0.47]	**<0.00001**	93%
SD-36 and RAND-36	physical functioning	SMD -21.74 [-35.70, -7.79]	**0.002**	81%
	general health perceptions	SMD -2.06 [-6.31, 2.19]	0.34	5%
	role emotional	SMD -5.99 [-26.18, 14.20]	0.56	85%
	bodily pain	SMD 2.50 [-14.93, 19.92]	0.78	88%
	mental health	SMD -10.39 [-21.53, 0.75]	0.07	85%
	social functioning	SMD 4.35 [-8.21, 16.91]	0.5	92%
	role physical	SMD -12.30 [-46.79, 22.18]	0.48	94%
	vitality	SMD -4.52 [-12.36, 3.33]	0.26	74%
	pooled results	SMD -5.97 [-11.29, -0.64]	**0.03**	90%

Notes: SMD: Standard Mean Difference; NA: Not Applicable.

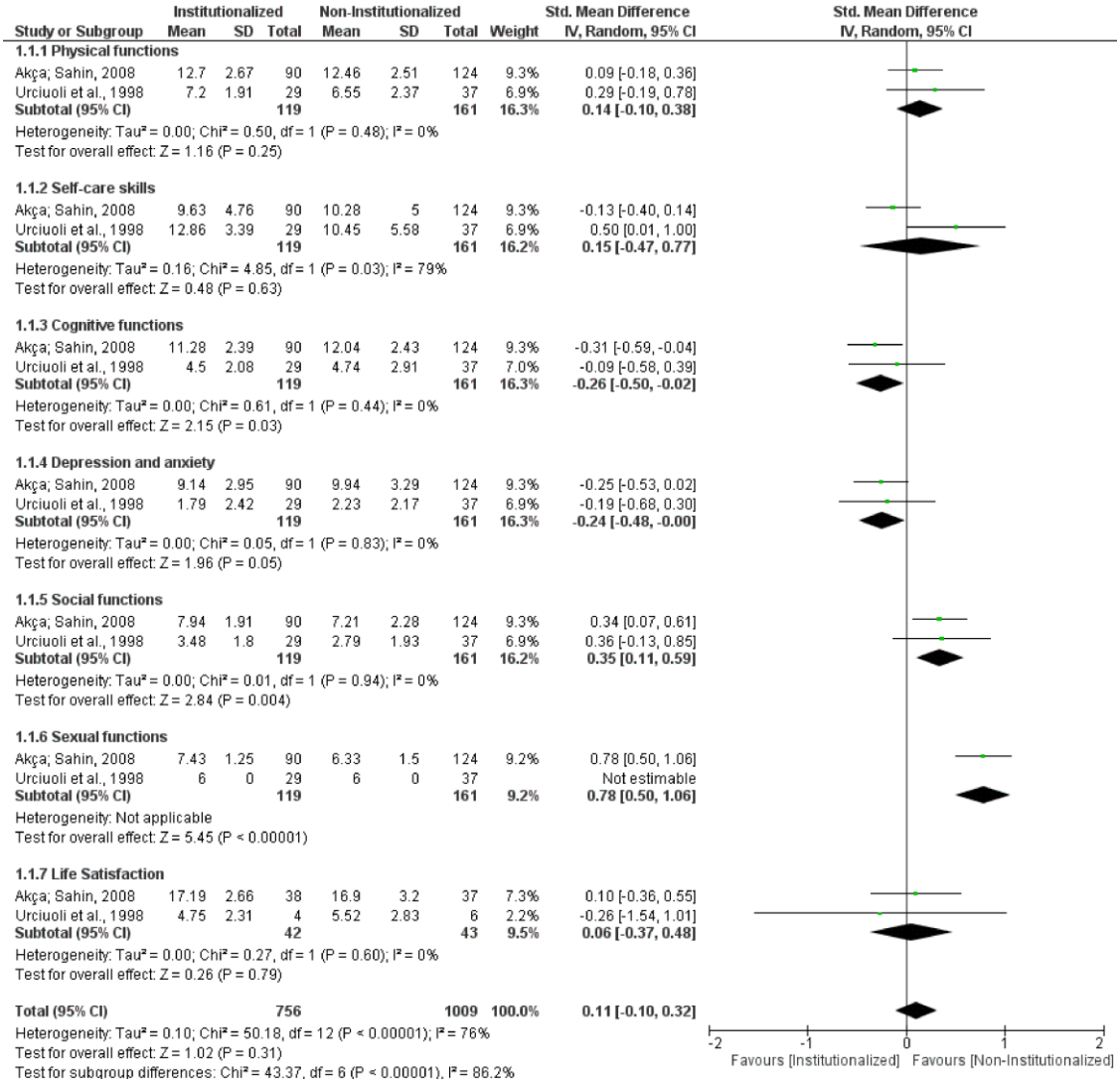

Figure 2. Forest plot of the influence of institutionalization on the elderly's quality of life according to the studies that used LEIPAD questionnaire.

Table 6. Evidence profile of quality of life of institutionalized and non-institutionalized elderly for LEIPAD questionnaire

Certainty assessment							Summary of findings			
№ of participants (studies) Follow-up	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Overall certainty of evidence**	**Study event rates (%)**		**Anticipated absolute effects**	
							With NIE	**With IE**	**Risk with NIE**	**Risk difference with IE**
LEIPAD – Overall										
1765 (2 observational studies)	very serious [a]	very serious [b,c]	not serious	not serious	very strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁◯◯◯ VERY LOW	1009	756	–	SMD **0.11 higher** (0.1 lower to 0.32 higher)
LEIPAD - Physical functions										
280 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	very strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁⨁◯◯ LOW	161	119	-	SMD **0.14 higher** (0.1 lower to 0.38 higher)
LEIPAD - Self-care skills										
280 (2 observational studies)	very serious [a]	very serious [b,c]	not serious	very serious [d,e]	very strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁◯◯◯ VERY LOW	161	119	-	SMD **0.15 higher** (0.47 lower to 0.77 higher)
LEIPAD - Cognitive functions										
280 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁◯◯◯ VERY LOW	161	119	-	SMD **0.26 lower** (0.5 lower to 0.02 lower)
LEIPAD - Depression and anxiety										
280 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁◯◯◯ VERY LOW	161	119	-	SMD **0.24 lower** (0.48 lower to 0)
LEIPAD - Social functions										
280 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⨁◯◯◯ VERY LOW	161	119	-	SMD **0.35 SD higher** (0.11 higher to 0.59 higher)
LEIPAD - Sexual functions										

280 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	161	119	-	SMD **0.78 higher** (0.5 higher to 1.06 higher)

LEIPAD - Life Satisfaction

85 (2 observational studies)	very serious [a]	not serious	not serious	serious [d]	very strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕⊕◯◯ LOW	43	42	-	SMD **0.06 higher** (0.37 lower to 0.48 higher)

Notes: SMD: Standard mean difference; a Only studies with some risk of bias were included in this analysis; b Considerable heterogeneity; c There is wide variation in the effect estimates across studies with little or no overlap of confidence intervals associated with the effect estimates; d Total number of participants is less than 400; e Upper and lower confidence limit crosses the effect size were greater than 0.5.

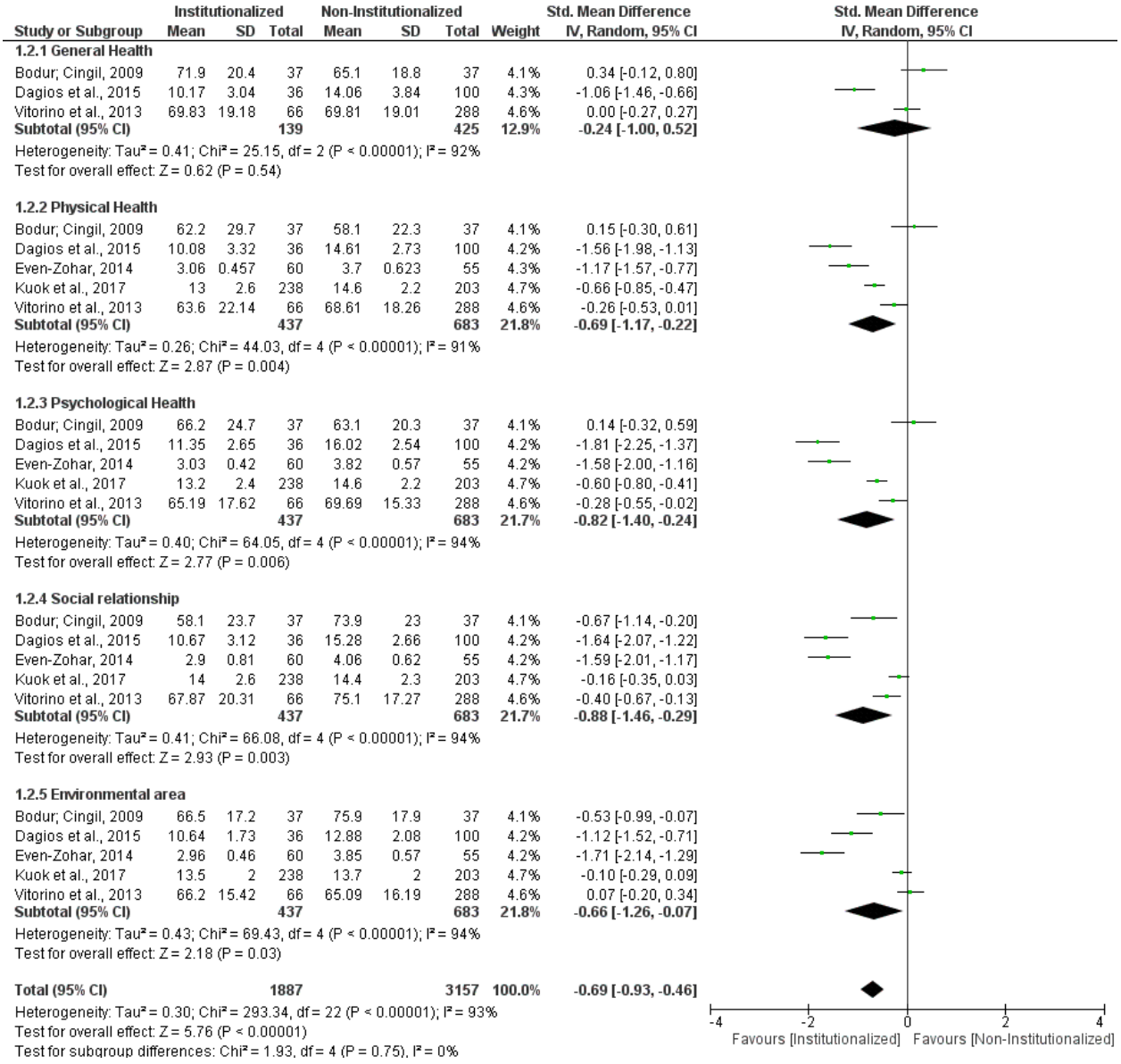

Figure 3. Forest plot of the influence of institutionalization on the elderly's quality of life according to the studies that used WHOQOL-BREF questionnaire.

Table 7. Evidence profile of quality of life of institutionalized and non-institutionalized elderly for WHOQOL-BREF questionnaire.

Certainty assessment							Summary of findings			
							Study event rates (%)		Anticipated absolute effects	
№ of participants (studies) Follow-up	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Overall certainty of evidence	With NIE	With IE	Risk with NIE	Risk difference with IE
WHOQOL-BREF – Overall										
5044 (5 observational studies)	not serious	serious [a]	not serious	not serious	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕⊕◯◯ LOW	3157	1887	-	SMD **0.69 lower** (0.93 lower to 0.46 lower)
WHOQOL-BREF - General Health										
564 (3 observational studies)	very serious [b]	very serious [a,c]	not serious	serious [d]	strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	425	139	-	SMD **0.24 lower** (1.0 lower to 0.52 higher)
WHOQOL-BREF - Physical Health										
1120 (5 observational studies)	not serious	very serious [a,c]	not serious	not serious	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	683	437	-	SMD **0.69 lower** (1.17 lower to 0.22 lower)
WHOQOL-BREF - Psychological Health										
1120 (5 observational studies)	not serious	very serious [a,c]	not serious	serious [d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	683	437	-	SMD **0.82 lower** (1.4 lower to 0.24 lower)
WHOQOL-BREF - Social relationship										
1120 (5 observational studies)	serious [e]	serious [a]	not serious	serious [d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	683	437	-	SMD **0.88 lower** (1.46 lower to 0.29 lower)
WHOQOL-BREF - Environmental area										
1120 (5 observational studies)	serious [f]	serious [a]	not serious	serious [d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	683	437	-	SMD **0.66 lower** (1.26 lower to 0.07 lower)

Notes: SMD: Standard mean difference; a Considerable heterogeneity; b Only studies with some risk of bias were included in this analysis; c There is wide variation in the effect estimates across studies with little or no overlap of confidence intervals associated with the effect estimates; d Upper and lower confidence limit crosses the effect size were greater than 0.5; e Effect and significance (p value) change after exclusion of studies with risk of bias (SMD -0.16 [-0.35, 0.03] p= 0.09); f Effect and significance (p value) change after exclusion of studies with risk of bias (SMD -0.10 [-0.29, 0.09] p= 0.3).

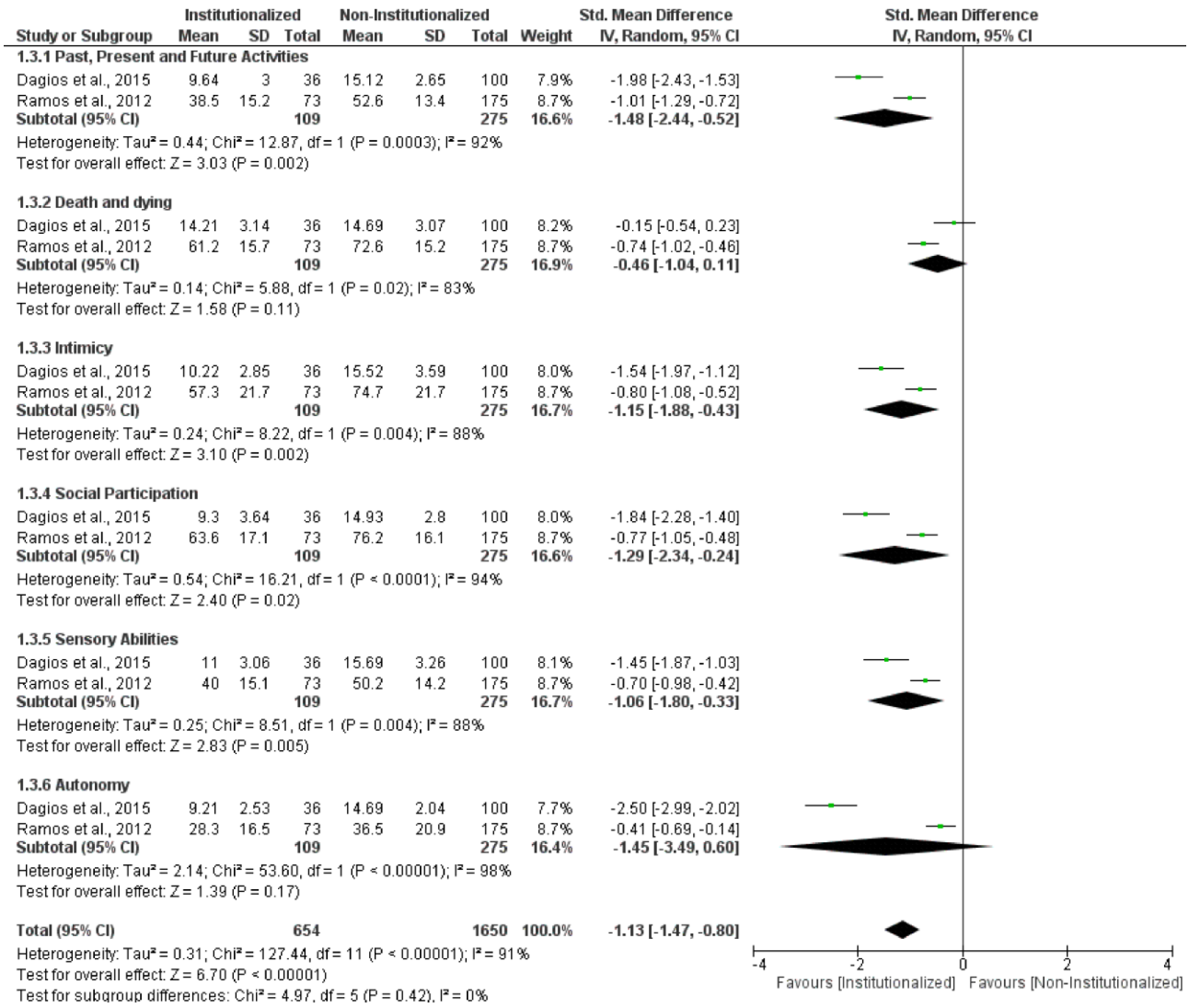

Figure 4. Forest plot of the influence of institutionalization on the elderly's quality of life according to the studies that used WHOQOL-OLD questionnaire.

Table 8. Evidence profile of quality of life of institutionalized and non-institutionalized elderly for WHOQOL-OLD questionnaire.

Certainty assessment							Summary of findings			
№ of participants (studies) Follow-up	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Overall certainty of evidence**	**Study event rates (%)**		**Anticipated absolute effects**	
							With NIE	**With IE**	**Risk with NIE**	**Risk difference with IE**
WHOQOL-OLD										
2304 (2 observational studies)	very serious [a]	serious [b]	not serious	serious [c]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	1650	654	-	SMD **1.13 lower** (1.47 lower to 0.8 lower)
WHOQOL-OLD - Past, Present and Future Activities										
384 (2 observational studies)	very serious [a]	serious [b]	not serious	very serious [c,d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **1.48 lower** (2.44 lower to 0.52 lower)
WHOQOL-OLD - Death and dying										
384 (2 observational studies)	serious [a]	serious [b]	not serious	very serious [c,d]	strong association all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **0.46 lower** (1.04 lower to 0.11 higher)
WHOQOL-OLD – Intimicy										
384 (2 observational studies)	very serious [a]	serious [b]	not serious	very serious [c,d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **1.15 lower** (1.88 lower to 0.43 lower)
WHOQOL-OLD - Social Participation										
384 (2 observational studies)	very serious [a]	serious [b]	not serious	very serious [c,d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **1.29 lower** (2.34 lower to 0.24 lower)
WHOQOL-OLD - Sensory Abilities										
384 (2 observational studies)	very serious [a]	serious [b]	not serious	very serious [c,d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **1.06 lower** (1.8 lower to 0.33 lower)
WHOQOL-OLD – Autonomy										
384 (2 observational studies)	very serious [a]	serious [b]	not serious	very serious [c,d]	all plausible residual confounding would suggest spurious effect, while no effect was observed	⊕◯◯◯ VERY LOW	275	109	-	SMD **1.45 lower** (3.49 lower to 0.6 higher)

Notes: SMD: Standard mean difference; a Only studies with some risk of bias were included in this analysis; b Considerable heterogeneity; c Total number of participants is less than 400; d There is wide variation in the effect estimates across studies with little or no overlap of confidence intervals associated with the effect estimates.

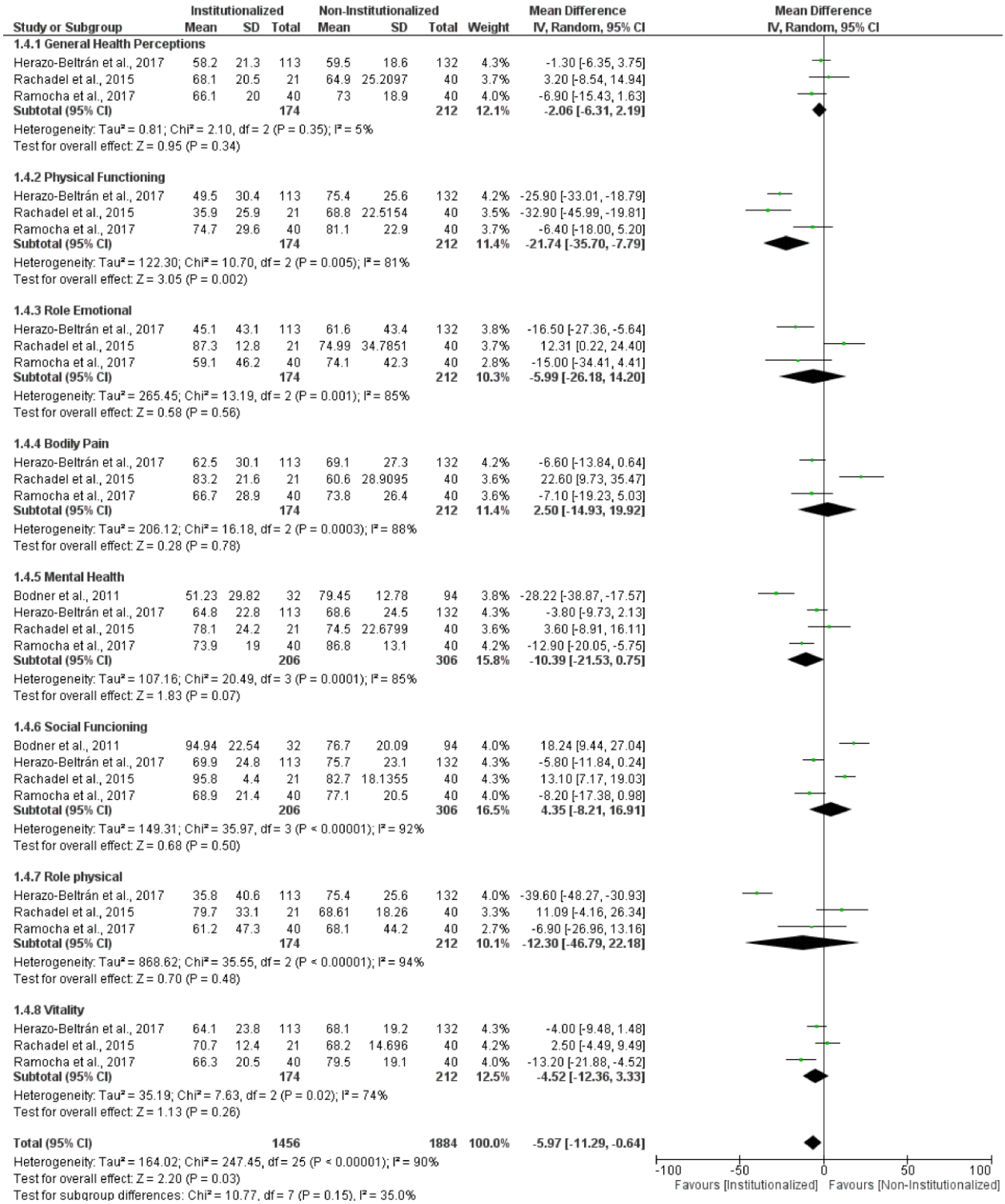

Figure 5. Forest plot of the influence of institutionalization on the elderly's quality of life according to the studies that used SF-36 or RAND-36 questionnaire.

Table 9. Evidence profile of quality of life of institutionalized and non-institutionalized elderly for SD-36 and RAND-36 questionnaires.

Certainty assessment							Summary of findings			
							Study event rates (%)		Anticipated absolute effects	
№ of participants (studies) Follow-up	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Overall certainty of evidence	With NIE	With IE	Risk with NIE	Risk difference with IE
SF-36 and RAND-36 - Overall										
3340 (4 observational studies)	very serious [a]	very serious [b,c]	not serious	serious [d]	very strong association	⨁◯◯◯ VERY LOW	1884	1456	The mean SF-36 and RAND-36 was **0**	MD **5.97 lower** (11.29 lower to 0.64 lower)
SF-36 and RAND-36 - General Health Perceptions										
386 (3 observational studies)	very serious [a]	not serious	not serious	very serious [d,e]	strong association	⨁◯◯◯ VERY LOW	212	174	The mean SF-36 and RAND-36 - General Health Perceptions was **0**	MD **2.06 lower** (6.31 lower to 2.19 higher)
SF-36 and RAND-36 - Physical Functioning										
386 (3 observational studies)	very serious [a]	serious [b]	not serious	very serious [d,e]	very strong association	⨁◯◯◯ VERY LOW	212	174	The mean SF-36 RAND-36 - Physical Functioning was **0**	MD **21.74 lower** (35.7 lower to 7.79 lower)
SF-36 and RAND-36 - Role Emotional										
386 (3 observational studies)	very serious [a]	very serious [b,c]	not serious	very serious [d,e]	very strong association	⨁◯◯◯ VERY LOW	212	174	The mean SF-36 RAND-36 - Role Emotional was **0**	MD **5.99 lower** (26.18 lower to 14.2 higher)
SF-36 and RAND-36 - Bodily Pain										
386 (3 observational studies)	very serious [a]	very serious [b,c]	not serious	very serious [d,e]	strong association	⨁◯◯◯ VERY LOW	212	174	The mean SF-36 RAND-36 - Bodily Pain was **0**	MD **2.5 higher** (14.93 lower to 19.92 higher)
SF-36 and RAND-36 - Mental Health										

512 (4 observational studies)	very serious [a]	serious [b]	not serious	serious [d]	very strong association	⊕◯◯◯ VERY LOW	306	206	The mean SF-36 RAND-36 (QVRS) - Mental Health was **0**	MD **10.39 lower** (21.53 lower to 0.75 higher)
SF-36 and RAND-36 - Social Functioning										
512 (4 observational studies)	very serious [a]	very serious [b,c]	not serious	serious [d]	strong association	⊕◯◯◯ VERY LOW	306	206	The mean SF-36 RAND-36 (QVRS) - Social Functioning was **0**	MD **4.35 higher** (8.21 lower to 16.91 higher)
SF-36 and RAND-36 - Role physical										
386 (3 observational studies)	very serious [a]	very serious [b,c]	not serious	very serious [d,e]	very strong association	⊕◯◯◯ VERY LOW	212	174	The mean SF-36 RAND-36 (QVRS) - Role physical was **0**	MD **12.3 lower** (46.79 lower to 22.18 higher)
SF-36 and RAND-36 - Vitality										
386 (3 observational studies)	very serious [a]	serious [b]	not serious	very serious [d,e]	strong association	⊕◯◯◯ VERY LOW	212	174	The mean SF-36 RAND-36 - Vitality was **0**	MD **4.52 lower** (12.36 lower to 3.33 higher)

Notes: MD: Mean difference; a Only studies with some risk of bias were included in this analysis. b Considerable heterogeneity. c There is wide variation in the effect estimates across studies with little or no overlap of confidence intervals associated with the effect estimates. d Upper and lower confidence limit crosses the effect size were greater than 0.5. e Total number of participants is less than 400

2.1 ARTIGO 2

Original Research

Masticatory function influences oral health-related quality of life, despite it is not correlated with nutritional status of elderly in nursing homes

Mastication in institutionalized elderly

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Abstract

Background: A poor masticatory function of institutionalized elderly can compromise their nutrition and Oral Health-Related Quality of Life (OHRQoL). **Objectives:** This multicenter study evaluated the influence of presence of teeth and dentures on masticatory performance and swallowing threshold in nursing homes elders. The correlation of these masticatory parameters with nutrition and OHRQoL was also verified. **Methods:** Elders (n=344; mean age (SD)=77.70 (9.10)) were selected from nursing homes of two Brazilian cities. Oral examinations were performed to classify the elders in edentulous with and without complete dentures (CD), and partially dentate with and without prosthesis. Masticatory performance was assessed using a two-colored chewing gum. Swallowing threshold was set by the number of chewing cycles performed until swallow a 3.7g of peanuts. Nutrition was screened by Mini Nutrition Assessment Short-Form and body composition. OHRQoL was evaluated through Geriatric Oral Health Assessment Index (GOHAI) and Oral Health Impact Profile (OHIP-14). Kruskal-Wallis test and Spearman's Correlation were used (α=0.05). **Results:** Edentulous elderly without CD had lower masticatory performance than those with CD and partially dentate with or without prosthesis ($P < 0.05$). The swallowing threshold of edentulous with CD and partially dentate with prosthesis were greater than edentulous without CD and partially dentate without prosthesis ($P < 0.05$). Masticatory parameters were not correlated with nutrition. Masticatory performance was correlated with GOHAI (r^2=-0.154) and swallowing threshold with GOHAI (r^2=0.162) and OHIP-14 (r^2=-0.146). **Conclusion:** The presence of teeth and dentures affected masticatory parameters. Although these masticatory parameters were not correlated with institutionalized elders' nutrition, their OHRQoL was impacted.

Keywords: aged, nursing homes, mastication, nutritional status, quality of life.

Background

Worldwide, there is an increase in life expectancy, which leads to a population aging trend.[1,2] Aged people require attention, however, the reduction in the availability of family members to provide elderly care, results in a transition of the elderly from the community to nursing homes, a process called institutionalization.[3] Nevertheless, a systematic review and meta-analysis[4] summarized that nursing home residents have higher number of decayed and missed teeth and higher prevalence of edentulism than the community-dwelling elders. Moreover, elderly residing in nursing homes presents low use of dentures.[5,6] Thereby, due to difficult to access oral health services,[5] living in a nursing home results in a poor oral health status, mainly regarding the absence of teeth and dentures.[4-6]

Tooth loss, when not replaced by dentures, compromises mastication.[7,8] Considering that chewing and swallowing are the first stages of food digestion,[9] the edentulism,[10,11] as well as the reduced number of functional occluding tooth pairs[12] and the absence of prosthetic rehabilitation[13] may affect food and nutrient intake. Consequently, the nutritional status of the elderly and their oral health-related quality of life (OHRQoL) can also be affected by such factors.[14-16] Hence, the oral health condition is an important factor related to general health and quality of life, being a concern in institutionalized elderly.

In this context, some studies[7,8,16,17] reported a relation among masticatory performance, chewing ability and the presence of teeth and use of prosthesis in elderly living in nursing homes. However, most of these studies[8,16,17] evaluated the masticatory ability through subjective parameters, resulting in unquantifiable information, which makes data reproduction and comparison difficult. Just one study[7] investigated the masticatory performance in institutionalized elderly by an objective test, using a two-color chewing gum. Nonetheless, most of their participants[7] were very old seniors and suffered from at least mild dementia, which may act as a bias and compromise results.

Therefore, this study aimed to evaluate the influence of the presence of teeth and use of dentures on the masticatory performance and swallowing threshold of elderly living in nursing homes. In addition, we also purpose to investigate the correlation between masticatory function in terms of masticatory performance and swallowing threshold, and nutritional status, body composition and OHRQoL of institutionalized elderly, in a multicenter sample.

Methods

The Institutional Ethics Committee under protocol numbers 66122917.6.0000.518 and 66122917.6.3001.5418 approved this cross-sectional study. Study participation was voluntary and consented by signing a form. Elderly aged 60 years or more and residing in a nursing home of Piracicaba and João Pessoa, cities of southeast and northeastern region of Brazil, were eligible for this study. The exclusion criteria were: (1) hearing and/or communication impairment and (2) neurological and/or cognitive disorders detected by Mini-Mental State Examination (MMSE).[18] The MMSE consists of eleven questions that evaluate the orientation, memory, attention, ability to name, follow verbal and written commands, write a sentence and copy a drawing, resulting in a final score (0-30 points).[18] From the total score (30 points), a minimum of 13 points was determined to consider the elderly able to answer the research questionnaires.[19]

The sample size (303 participants) of this study was determined considering a response rate of 50%, a confidence interval of 95%, a design effect of 1.5 and statistical power of 80%, based on a previous study.[4] Therefore, 344 elderly were included, being 204 residents of 10 nursing homes from Piracicaba city, and 140 living in seven homes for the aged of João Pessoa city. Once selected, elderly's data refers to socioeconomic characteristics (age, gender and time living in the nursing home), oral health condition, use of dentures, masticatory performance, swallowing threshold, nutritional status, body composition and OHRQoL were collected through a face to face interview.

Oral health condition, use of dentures, masticatory performance and swallowing threshold

The oral health condition was assessed by decayed, missing and filled teeth index (DMFT), being investigated trough oral examinations that were performed by two calibrated examiners (Kappa value > 0.7). The DMFT was evaluated according to World Health Organization (WHO) criteria[20] and used to classify the older according to the presence of teeth in edentulous or partially dentate. The elderly who were using a denture during interview was considered a denture wearer. Based on the presence of teeth and use of dentures, the elders were classified into four groups: *(1)* edentulous with complete dentures (CD), *(2)* edentulous without CD, *(3)* partially dentate with prosthesis, and *(4)* partially dentate without prosthesis.

Masticatory performance was verified through the natural chew of a two-colored chewing gum (Vivident Fruitswing Karpuz, Turkey) for 20 chewing cycles, counted by a trained examiner.[21,22] The chewed gum was collected in a transparent plastic bag and flattened under manual pressure between

two glass plates, maintaining the thickness of 1 mm. Both sides of the flattened chewed gum were scanned (HP Deskjet 3510 Series) into JPEG files with 300 dpi resolution.[21,22] The images were imported into the freeware ViewGum© software (dHAL Software, Greece, http://www.dhal.com), where an electronic colorimetric assessment was performed.[21,22] The electronic colorimetric analyzed the hue variance, that is, the degree of color mixing.[21,22] Lower hue variance means better color mixing and, consequently, better masticatory performance.[21,22]

The swallowing threshold was evaluated by the number of chewing cycles performed by the volunteer to chew a portion of unsalted roasted peanuts (3.7g) until felt him/her the urge to swallow.[9,23] The number of completed chewing cycles was recorded by a trained examiner. Before testing, the researcher instructed the participants to chew and swallow the peanuts as usual.

Nutritional status and body composition

The Mini-Nutritional Assessment Short-Form (MNA-SF) (Rubenstein et al., 2001) was used to evaluate the elderly's nutritional status. This tool consists of questions regarding to food intake, weight loss, mobility, psychological stress or acute illness and neuropsychological problems, and classify the elderly according to their Body Mass Index (BMI) or calf circumference.[24] Considering that measurement of BMI was not possible in wheelchair volunteers, the calf circumference data was used to standardize the calculation of MNA-SF total score for all participants.[24] The MNA-SF add up to 0 to 14 points and classify the individuals as nourished (12-14 points), at risk of malnutrition (8-11 points) and malnourished (0-7 points).[24]

The body composition was assessed by a bioelectrical impedance analysis (BIA) that generates measurements such as body height (cm), weight (Kg), BMI (kg/m^2), muscle mass (Kg) and body fat (%). A bioimpedance balance (Tanita BC-601 – InnerScan) with 0.1% accuracy was used to perform the BIA.

Oral health-related quality of life

The OHRQoL was evaluated by the Brazilian version of Geriatric Oral Health Assessment Index (GOHAI)[25,26] and short form of Oral Health Impact Profile (OHIP-14)[27,28] questionnaires. The GOHAI is composed for 12 questions that assess the elderly's self-perception regarding the influence of their oral health problems on the QoL refers to physical and functional functions, psychological aspects, pain and discomfort.[25,26] The items can score from one to three points, corresponding, respectively, to the

responses always, sometimes and never.[25,26] The questionnaire total score can range for each person from 12 to 36 points and it is obtained by add upping the score of each item.[25,26] The higher the final score, the better the self-perception of ORHQoL.[25,26]

The OHIP-14 assess the impact of oral health on quality of life through 14 items that composes seven subscales refers to functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap.[27,28] All questions present five responses options according to a Likert scale ranging from zero to four (0=never, 1=hardly ever, 2=occasionally, 3=fairly often and 4=very often).[27,28] The total score can range from zero to 56 points and higher scores indicate worse OHRQoL.[27,28]

Statistical analyses

The association among the masticatory performance and swallowing threshold of the elderly (dependent variables) with the presence of teeth and use of dentures (independent variable) was assessed using Kruskal-Wallis test with Bonferroni adjustment ($\alpha<0.05$). The Kruskal-Wallis test ($\alpha<0.05$) was also used to compare the elderly residents in nursing homes of the two cities included in this study regarding the presence of teeth and use of dentures, masticatory performance and swallowing threshold. The Spearman's correlation (r^2) was used to evaluate the correlation among the dependent variables (MNA-SF total score, BMI, muscle mass, body fat, GOHAI and OHIP-14 final scores) with the independent variables (masticatory performance and swallowing threshold), considering $\alpha<0.05$. All the analyses were performed in The Statistical Package for Social Sciences software (SPSS for Windows, version 20.0, SPSS Inc, Chicago, IL, USA).

Results

A total of 823 elderly people was living in the nursing homes of Piracicaba and João Pessoa cities. Out of this total, 22 were hearing and/or communication impaired, 430 presented neurological and/or cognitive disorders and 27 refused to participate. Thus, a total 344 elderly were included and accepted to participate in this study. The mean age of participants was 77.70 years and the majority were female (n=206, 59.9%).

Most of the elderly people were partially dentate without prosthesis (Table 1). The mean (SD) of the masticatory performance of institutionalized elderly was 0.41(0.17) (Table 2), which means that

the chewing gum was slightly mixed, remaining bits of unmixed original color. Participants performed a mean of 38.80 (54.16) chewing cycles to chew a portion of roasted peanuts until the moment of swallowing (Table 2).

Edentulous participants without CD showed lower masticatory performance values ($P < 0.05$) compared to those edentulous with CD, partially dentate with prosthesis and partially dentate without prosthesis (Figure 1). However, edentulous aged people with CD, partially dentate with prosthesis and partially dentate without prosthesis did not differ from each other regarding masticatory performance ($P > 0.05$, Figure 1).

The swallowing threshold values of the edentulous institutionalized elderly using CD and partially dentate without prosthesis were greater ($P < 0.01$), than the swallowing threshold of those without CD and those partially dentate without prosthesis (Figure 2). Moreover, partially dentate elders without prosthesis also presented greater swallowing threshold than the edentulous without CD ($P < 0.01$; Figure 2). The presence of teeth and use of prosthesis, as well as the masticatory performance and swallowing threshold, did not differ between the institutionalized elders of the two cities included in this study ($P >0.05$).

The masticatory performance and swallowing threshold were not correlated with the nutritional status (MNA-SF total score) and body composition (BMI, muscle mass and body fat) of the institutionalized elderly ($P > 0.05$, Table 3). Regarding the ORHQoL, for the GOHAI and OHIP-14 questionnaires, the mean (SD) of the participants was 32.44 (3.85) and 7.58 (8.64), respectivelly (Table 2). The masticatory performance and GOHAI total score were weakly and negatively correlated ($P < 0.05$, $r^2=-0.154$), indicating that the higher the hue variance of the chewing gum (worse masticatory performance) the lower the GOHAI final score, which means worse self-perception of ORHQoL (Table 3). A weak positive correlation ($P < 0.05$, $r^2=0.162$) was revealed among swallowing threshold and GOHAI final score, meaning that higher swallowing threshold leads to a better self-perception of ORHQoL (Table 3). In addition, a higher swallowing threshold resulted in a lower OHIP-14 total score (better OHRQoL), indicating a weak negative correlation ($P < 0.05$; $r^2=-0.146$, Table 3).

Discussion

This study verified that the absence of tooth and dentures influence the masticatory performance and swallowing threshold of elderly living in nursing homes. This impaired masticatory function could affect

the nutritional status of the older due to a decrease in food and nutrient intake. Interestingly, our results demonstrated that the nutritional status and body composition of institutionalized elderly were not impaired by their poor masticatory performance and swallowing threshold. However, the masticatory performance and swallowing threshold negatively impacted the OHRQoL. Therefore, the masticatory function recovery through prosthetic rehabilitation is important for improve the well-being of institutionalized elderly.

The sieve method has been the method widely used to quantify the masticatory performance. However, in CD wearers the chewing of the artificial food material could be prevented due to some particles end up under the mandibular prosthesis.[29] Moreover, elders with a poor oral health condition have a reduced maximum bite force, which difficulties the fragmentation of the test food.[29] Therefore, for demonstrated reliable results regarding elderly with compromised oral condition[29] and for be a viable method to assess the masticatory performance in an epidemiological study with a large sample of nursing home residents, the chewing mixing ability was chosen to be used in this research.

In the present study, the prevalence of edentulous without CD was higher (25.4%) than a German report (20.6%).[7] In addition, the masticatory performance (mean values ± SD) of our participants was lower (0.414 ± 0.173) than that found by the same investigation[7] (0.590 ± 0.250). These results highlight that the Brazilian nursing homes offer little access to oral health services.[5] The contrasting masticatory performance values between our study and that from German[7] could be explained by methodological differences, once the German study had included participants with dementia, which decrease masticatory performance.[30] Moreover, it can be hypothesized that, although the tooth loss and absence of denture, the volunteers of our study were able to adapt the chewing to their poor oral health status, maintaining a regular masticatory performance.

Our results demonstrated a worse masticatory performance for edentulous individuals without CD than for those CD wearers and for partial edentulous elders wearing or not dental prostheses. This result is partially supported by Klotz et al.[7] who also found a significant difference between chewing performance of elderly without denture and aged people with natural teeth or fixed dental prostheses or removal dental prostheses. However, the last authors[7] did not find difference in the masticatory performance among edentulous without CD in at least one dental arch and edentulous with bimaxillary CD. This unexpected absence of difference was justified by the high prevalence of poor denture condition.[7] Based on our findings, a good chewing performance depends of the presence prosthetic

rehabilitation, regardless the dental replaced configuration, whether total, partial or fixed prostheses. In addition, the denture condition should be considered, being essential well-fitting and retentive prostheses.[7]

Likewise, the swallowing threshold of institutionalized elderly was also influenced by total edentulism when in denture absence. Although CDs wearers and partially dentate individuals with prosthesis had a significantly higher swallowing threshold than partial dentate without prosthesis, the number of chewing cycles performed by the last ones until felt the urge to swallow (32 chewing cycles) was enough to form a suitable cohesive bolus for swallowing.[9,22] This finding demonstrated that the absence of prosthesis for partially dentate individuals was not able to totally impair their masticatory function.

It was not possible to contrast our swallowing threshold values with those from literature, because we are unaware of studies on this topic in elderly residing in nursing homes. However, one investigation[16] that assessed the influence of dental and prosthodontic status on the chewing and swallowing difficulties in institutionalized elderly found an association among edentulousness without dentures and more chewing and swallowing difficulties. This support our findings and emphasizes the importance of prosthetic rehabilitation in maintaining a good masticatory function. Therefore, the nursing homes should provide to the elderly access to prostheses rehabilitation.

We observed no difference between the institutionalized elderly of the two cities included in this study regarding the presence of teeth and use of dentures, masticatory performance and swallowing threshold. However, according to an oral health survey conducted in the country,[31] community dwelling elderly people living in the southeast region have greater use of dental prosthesis than those in the northeastern. This result suggests that the institutionalization influence negatively the elderly's oral health condition, regardless the region of the country where the nursing home is located. Therefore, institutionalized aged people needs more oral health care.

Unexpectedly, the masticatory performance and swallowing threshold did not affect the nutritional status and body composition of the elderly living in nursing homes. The nursing homes establish a correctly meal time routine, ensuring that the elderly eat properly. The food is also adapted to the oral health condition of the residents, being most liquid and pasty, which facilitates the chewing and, consequently, the food intake.[32] In addition, oral nutritional supplementation is a commonly practice in nursing homes, supplying nutritional deficiencies of the elderly trough nutrient replacement.[33] Moreover, the participants of this study may have

adapted the chewing to their teeth and prosthodontic configuration, developing the ability to ingest food. The set of these factors probably makes feeding easier, ensuring food intake and good nutritional status of the elderly, which can explain our outcomes.

The absence of correlation between masticatory function and nutritional status could also be explained by the particle size of the food ingested.[34] It is known that ingestion of large particles of food hamper the action of digestive enzymes and, consequently, the nutrients absorption.[35] Considering that deficits in nutrients absorption cannot be detected by the nutritional parameters used in this study, a serum level assessment should be performed to confirm that a compromised masticatory function does not influence the nutritional status in elderly living in nursing homes.[35] In addition, considering the relationship between poor masticatory function and tooth loss,[7,8] mastication should not be considered irrelevant to general health of aged people, once institutionalized elderly without occluding posterior teeth has an increased risk of death.[36]

In this investigation, while masticatory performance was weakly correlated with the OHRQoL evaluated through GOHAI questionnaire, no significant correlation was observed by applying the OHIP-14. This finding is probably due to differences between these questionnaires. The GOHAI better evaluate the 'oral functional limitations' dimension, while the OHIP-14 focus in the psychological and behavior aspects.[37] In addition, for the GOHAI, the 'functional limitations' dimension is composed by questions that addresses biting, chewing, swallowing and speaking.[37] Differently, for OHIP-14, the items of the 'functional limitations' domain refers to pronouncing words and sense of taste.[37] In contrast with our findings, a previous study observed that low chewing ability was associated with worse OHRQoL measured by OHIP-14 in South Korean long-term care facilities residents.[38] The different method used to assess the masticatory function of the institutionalized elderly may be the reason of this divergence, considering that the chewing ability is a subjective parameter, which can influence the results.

We also observed that institutionalized elderly with poor swallowing threshold presented a worse self-perception and impact of OHRQoL assessed through GOHAI and OHIP-14 questionnaires. This negatively OHRQoL self-perception could be explain by the elderly feeling bad for perceive that the masticatory problems are causing of discomfort, difficulty and interruption during feeding.[25-28] However, considering that the correlation was weak, this outcome should be observed with caution. Even so, in order to provide a good OHRQoL, it is important reestablish the masticatory function of the institutionalized elderly. For this, oral health services should be implemented in the nursing homes, allowing access to prosthetic rehabilitation and others dental care treatments.

This study presents a drawback refers to the cross-sectional design, which cannot establish cause-effect relationships. In addition, the nutrients absorption was not considered in the evaluation of the nutritional status. Thus, studies are required to assess the association between the masticatory performance and serum albumin test results. Despite these limitations, it is important to highlighting the multicentric nature of this study, which included two cities in different regions of Brazil, southeast and northeastern. Hence, this study provides an overview of the oral health condition of the elderly living in nursing homes in Brazil, generating representative results. Therefore, the findings of this study indicated the necessity of a dentist in the nursing homes, aimed to provide prevention and promotion of oral health through dental treatments and tooth replacement, reestablishing the masticatory function and ORHQoL of the institutionalized elderly.

Conclusion

The presence of teeth and use of dentures affect the masticatory performance and swallowing threshold of elderly living in nursing homes. However, the masticatory function (masticatory performance and swallowing threshold) did not influence the nutritional status and body composition of institutionalized elderly, despite impairing their OHRQoL.

Disclosure

Ethical approval

All procedures performed were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments.

Informed consent

Informed consent was obtained from each participant included in the study.

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Conflict of interest

The authors declare no conflict of interest.

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T**able 1.** Characterization of institutionalized elderly people regarding presence of teeth and use of dentures.

Variables	**n**	**%**
Edentulous with complete dentures	86	25.4
Edentulous without complete dentures	86	25.4
Partially dentate with prosthesis	28	8.3
Partially dentate without prosthesis	139	41.0

Table 2. Description of variables refers to masticatory function, nutritional status and oral health-related quality of life of the institutionalized elderly.

Variable	Average	Standard Deviation	Median	Quartile 25-75
Chewing performance	0.41	0.17	0.40	0.27-0.54
Swallowing threshold	38.80	54.16	0.00	0.00-68.75
MNA-SF (total score)	10.53	2.93	11.00	9.00-13.00
BMI (kg/m^2)	27.12	19.38	25.50	22.52-29.00
Muscle mass (kg)	42.31	8.60	40.85	35.30-48.40
Body fat (%)	31.12	9.79	30.85	25.02-37.17
GOHAI (total score)	32.44	3.85	34.00	31.00-35.00
OHIP-14 (total score)	7.58	8.64	5.00	0.00-11.00

Table 3. Correlation among masticatory performance and swallowing threshold with the nutritional status (MNA-SF, BMI, muscle mass and body fat) and oral health-related quality of life (GOHAI and OHIP-14) of institutionalized elderly people.

		Chewing performance	Swallowing threshold	MNA-SF	BMI	Muscle mass	Body fat	GOHAI	OHIP-14
Chewing performance	**r^2**	1.000							
	p-value	-							
Swallowing threshold	**r^2**	-0.148	1.000						
	p-value	**0.011**	-						
MNA-SF	**r^2**	-0.058	0.073	1.000					
	p-value	0.298	0.198	-					
BMI	**r^2**	-0.013	0,050	0.232	1.000				
	p-value	0.849	0.473	**<0.001**	-				
Muscle mass	**r^2**	0.003	-0.012	0.299	0.318	1.000			
	p-value	0.964	0.860	**<0.001**	**<0.001**	-			
Body fat	**r^2**	-0.078	0.115	0.175	0.683	-0.221	1.000		
	p-value	0.255	0.100	**0.009**	**<0.001**	**0.001**	-		
GOHAI	**r^2**	-0.154	0.162	0.214	0.027	-0.078	0.111	1.000	
	p-value	**0.006**	**0.004**	**<0.001**	0.685	0.243	0.096	-	
OHIP-14	**r^2**	0.094	-0.146	-0.357	-0.031	-0.060	-0.071	-0.671	1.000
	p-value	0.094	**0.010**	**<0.001**	0.648	0.373	0.262	**<0.001**	-

Figure legends

Fig. 1. Masticatory performance of elderly people residing in nursing homes according to the presence of teeth and use of dentures.

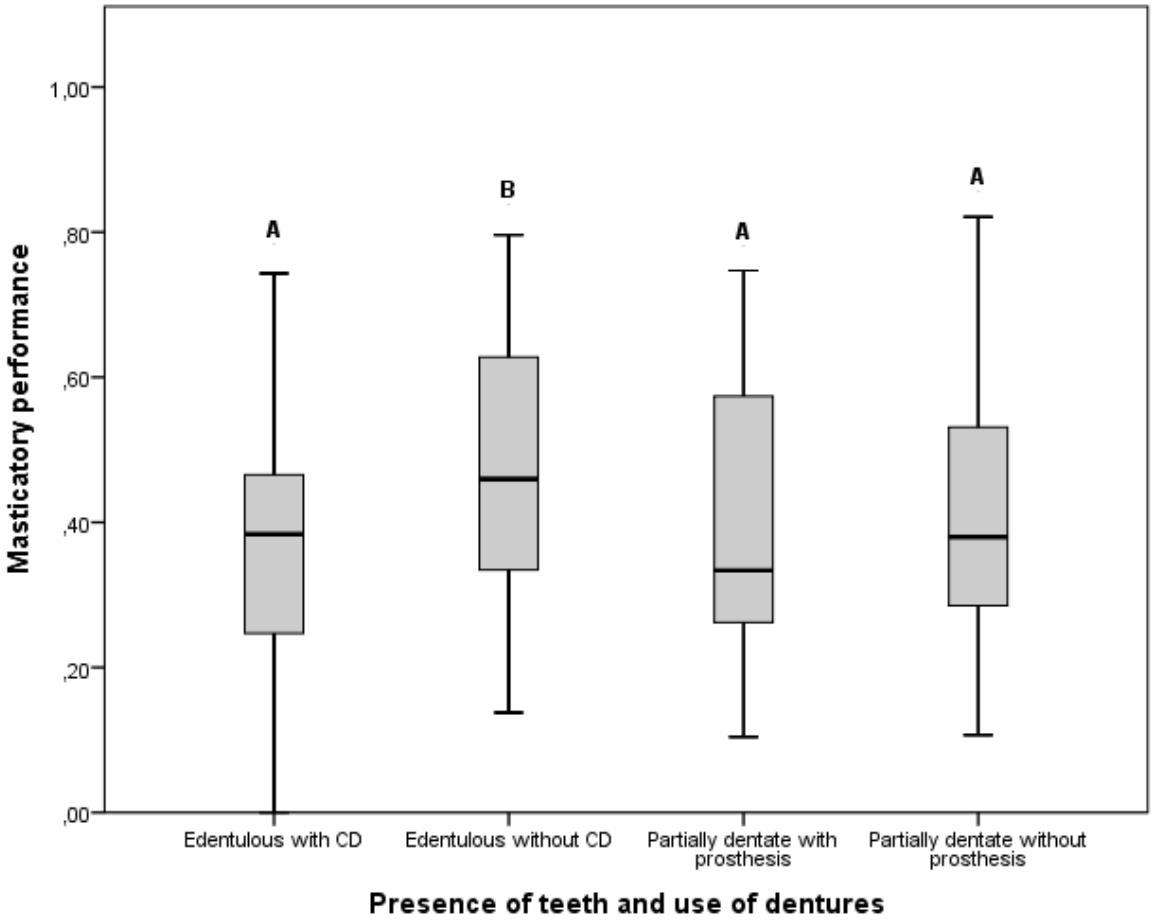
Note. Different letters indicate statistically significant differences ($P < 0.05$)

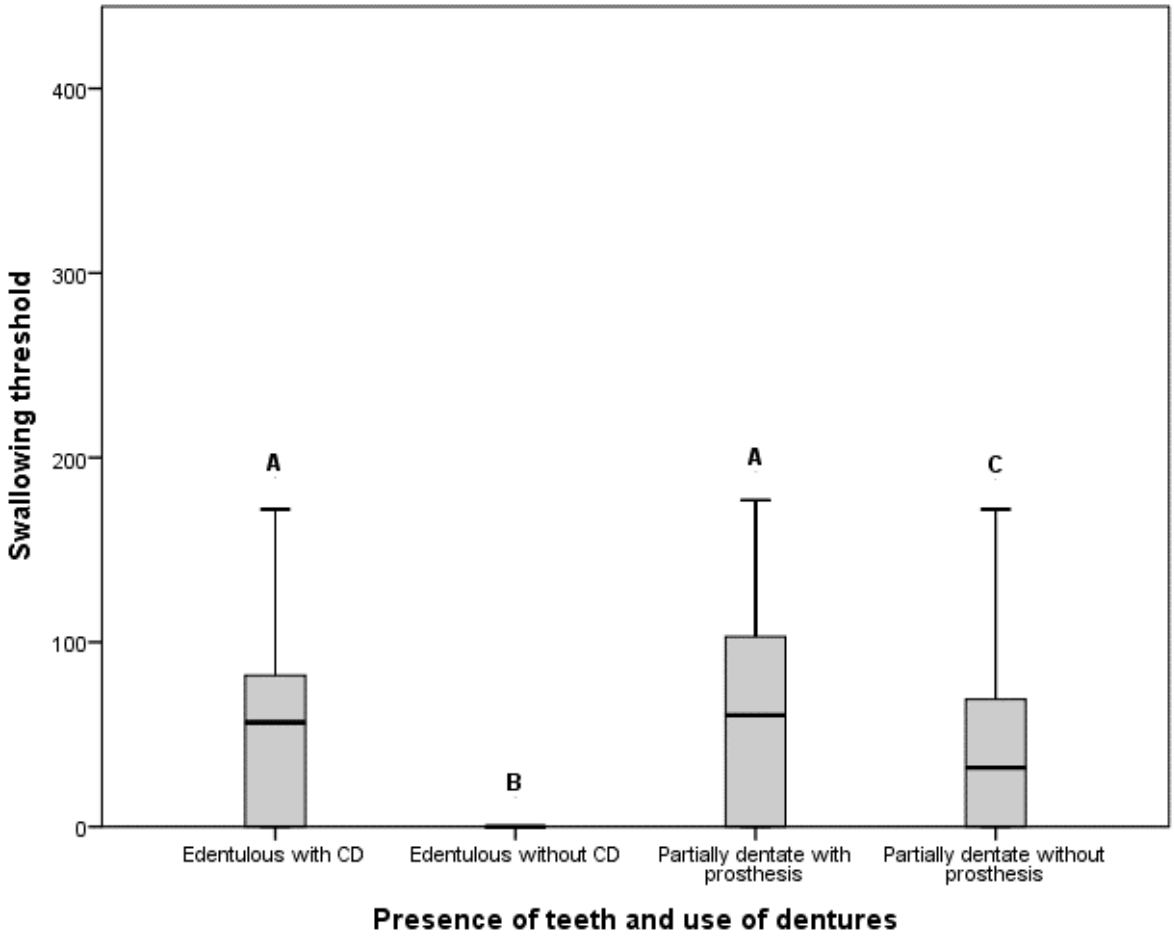
CD: Complete dentures

Fig. 2. Swallowing threshold of elderly people residing in nursing homes according to the presence of teeth and use of dentures.

Note. Different letters indicate statistically significant differences ($P < 0.05$).

CD: Complete dentures


1,00
,80
,60
,40
,20
,00
Masticatory performance
A
B
A
A
Edentulous with CD
Edentulous without CD
Partially dentate with prosthesis
Partially dentate without prosthesis
Presence of teeth and use of dentures


Swallowing threshold
400
300
200
100
0
A
B
A
C
Edentulous with CD
Edentulous without CD
Partially dentate with prosthesis
Partially dentate without prosthesis
Presence of teeth and use of dentures

2.3 ARTIGO 3

Factors associated with the overlap of frailty and nutrition in institutionalized elderly: a multicenter study

Running title: Overlap of frailty and nutrition in institutionalized elders

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Abstract

Objectives: This multicenter cross-sectional study aimed to investigate the factors associated with the overlap of frailty and nutrition in elderly residing in nursing homes. **Method:** Elderly people (n=344, mean age (SD)=77.70 (9.10)) were selected in 17 nursing homes, 10 of Piracicaba and 7 of João Pessoa, Brazil. The Mini Nutrition Assessment Short-Form (MNA-SF) and the modified Fried's questionnaire were used for screening of frailty phenotype. Both variables were overlapped into (1) frail and malnourished; (2) non-frail and malnourished or frail and nourished; and (3) non-frail and nourished. The following parameters were analyzed with regards to their influence on frailty and nutrition: sex, age, mobility, number of medications, dependence for activities of daily living (ADL), maximal grip strength, muscle mass, body fat and body mass Index (BMI). Frailty and MNA-SF scores were correlated using Spearman's Correlation (α=0.05). Data were analyzed by Poisson Regression (α=0.05), obtaining Prevalence Ratio (PR) and Confidence Interval (95% CI). **Results:** A moderate correlation (r^2=-0.441) was observed between frailty (mean=2.79, SD=1.74) and nutritional status (mean=10.52, SD=2.9). Regarding the overlap of frailty and nutrition, 139 (40.5%) were frail and malnourished, 121 (35.3%) were non-frail and malnourished or frail and nourished, and 83 (24.2%) were non-frail and nourished. Frailty and malnutrition was associated with age ((PR=1.009, 95%IC=1.003-1.016), number of medications (PR=1.016, 95%CI=1.006-1.027), dependence for ADL (PR=1.061, 95%CI=1.016-1.108), maximal grip strength (PR=0.992, 95%IC=0.986-0.998) and BMI (PR=0.997, 95%IC=0.996-0.998). **Conclusions:** Frailty and malnutrition were prevalent in institutionalized elderly and associated with advanced age, greater use of medicines, dependence for ADL, lower maximal grip strength and lower BMI.

Keywords: aged, institutionalization, nursing homes, frail elderly, nutritional status.

1. Introduction

The world population is aging (Reher et al., 2015) and, as a result, there is an increase in geriatric syndromes, such as frailty (Woo et al., 2017). Frailty has a multifactorial nature and it is characterized mainly by physical impairment (Junius-Walker et al., 2018; Sezgin et al., 2019). However, physiological, biological, functional and psychosocial impairment could also be present (Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019). As consequence, besides reducing physiological reserves and resistance (Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019), elderly people present reduction of skeletal muscle mass and loss of motor and strength control. Thereby, the elderly are very susceptible to adverse outcomes, such as a decline in autonomy to perform activities of daily living (ADL) and increased morbidity and mortality rates (Fried et al., 2001; Junius-Walker et al., 2018; Sezgin et al., 2019).

Beyond frailty, malnutrition is another multifactorial syndrome widespread among elderly (Dominguez; Barbagallo, 2017; Meier; Stratton, 2008; Volkert et al., 2019). The aging process causes sensory alterations in taste and smell, which leads to reduced appetite, modification of eating habits and decreased dietary intake, resulting in an imbalanced nutrient absorption (Dominguez; Barbagallo, 2017; Meier; Stratton, 2008; Volkert et al., 2019). This imbalance alters the body composition and decrease physical function, causing malnutrition (Meier; Stratton, 2008). Besides the sensory alteration, advanced age is frequently accompanied by chewing and psychological impairment that may also cause decrease in the food intake and affect the nutritional status (Dominguez; Barbagallo, 2017; Meier; Stratton, 2008). Furthermore, as for frailty, malnourished elderly have reduced body mass, strength and functional capacity, as well as a higher risk of morbidity and mortality (Dominguez; Barbagallo, 2017; Laur et al., 2017; Santana et al., 2019).

In community dwelling elderly, factors associated with frailty and malnutrition are well-known (Favaro-Moreira et al., 2016; Feng et al., 2017; Sezgin et al., 2019). For frailty, the risk

factors are: older age, female sex, lower educational level, lower socioeconomic status, low body mass Index (BMI), malnutrition, dependence for ADL, depression and cognitive impairment (Feng et al., 2017; Sezgin et al., 2019). Regarding malnutrition in community dwelling aged people, the factors associated are advanced age, frailty, polypharmacy, poor general health, cognitive decline, psychological impairment and dysphagia (Favaro-Moreira et al., 2016).

Frailty and malnutrition are known to be predictive factors for elderly institutionalization (Kojima, 2018; Luppa et al., 2010), once the family members consider that they are unable to perform the required care to elder (Luppa et al., 2010). On the other hand, reside in a nursing home can influence the prevalence and factors associated with frailty and malnutrition (Dominguez; Barbagallo, 2017; Kojima, 2018; Kaiser et al., 2010; Meier; Stratton, 2008). Nevertheless, from a multicenter perspective, the prevalence and factors associated with frailty and malnutrition in institutionalized elderly are poorly known.

Moreover, although frailty and malnutrition are commonly present simultaneously among the aged (Laur et al., 2017), this coexisting has not been considered during the evaluation of factors associated with these two geriatric syndromes in institutionalized elderly. Therefore, this multicenter cross-sectional study aimed to investigate the risk or protective factors associated with the coexisting of frailty and malnutrition in elderly living in nursing homes.

2. Material and Methods

2.1 Ethical aspects

The present study was approved by the Institutional review board (protocol 66122917.6.0000.518 and 66122917.6.3001.5418), following the Helsinki Declaration of 1964 and their posteriors alterations. All volunteers who agreed to participate signed a consent form.

2.2 Study design

A multicenter, explanatory, observational, cross-sectional study was conducted in two cities of Brazil, one located in the southeast region (Piracicaba) and other in the northeastern region (João Pessoa) of the country. The sample size was calculated based on a previous study (Silva e Farias, 2018), considering a response rate of 50%, a confidence interval of 95%, a design effect of 1.5 and statistical power of 80%. Therefore, the minimum sample size required for this study was 303 participants.

The research was conducted in 17 nursing homes, including 204 elderly selected from 10 institutions of Piracicaba, and 140 aged people from 7 nursing homes of João Pessoa, totalizing a convenience sample size of 344 volunteers. The elderly were selected according to the following inclusion criteria: (1) aged 60 years or more and (2) be resident in a nursing home. Aged people hearing and/or communication impairment and presenting neurological and/or cognitive disorders, detected by the Mini-Mental State Examination (MMSE) (Folstein et al., 1975), were excluded of the study. The MMSE includes eleven questions subdivided in two sections (Folstein et al., 1975). The first section screening the orientation, memory and attention and the second evaluate the ability to name, follow verbal and written commands, write a sentence and copy a drawing. The MMSE score can range from zero to 30 points (Folstein et al., 1975). The minimum cut-off of 13 points, established in a previous study (Bertolucci et al., 1994), was used to consider the elderly neurological and cognitive proficiency to answer the research questionnaires.

2.3 Data collection

The socioeconomic data regarding sex, age, mobility, number of medications and time of residing in the nursing home were collected through a face to face interview. The physical state and nutritional status were evaluated using a validated questionnaires and methods.

2.3.1 Physical state

The physical state was evaluated through the dependence for ADL by Katz Scale (Lino et al., 2008) and Frailty screening (Nunes et al., 2015). The Katz Scale aims to evaluate the functional capacity of the elderly in self-care performance through six items related to feeding, continence, transferring, going to toilet, dressing and bathing (Lino et al., 2008). The elderly could be classified for each item as independent or dependent. Independence means performing the six functions without supervision, guidance or active personal assistance (Lino et al., 2008). Therefore, the Katz Scale can range from zero (independent) to six points (high dependence) (Lino et al., 2008).

The frailty phenotype was assessed using a self-reported instrument (Nunes et al., 2015), adapted from the original model (Fried et al., 2001). The self-reported instrument is composed to dichotomous questions regarding the components of the Fried's frailty phenotype: unintentional weight loss, exhaustion, low physical activity level, weakness and lowness (Nunes et al., 2015). The elderly could be classified based on score obtained as frail (three or more points), pre-frail (one-two) or non-frail (zero) (Nunes et al., 2015).

In addition to the frailty screening, the maximal grip strength of the elderly was assessed using a JAMAR model J00105 hand-held digital dynamometer, as recommended by the American Society of Hand Therapists. Before testing, the examiner issued a verbal command that authorized the elderly to tighten the dynamometer for six seconds with dominant palmar, obtaining the maximal grip strength in kilogram-force (Kgf) (Fried et al., 2001). The maximal grip strength, adjusted by sex and BMI, was classified as adequate or inadequate according to original Fried's cutoff values (Fried et al., 2001).

2.3.2 Nutritional status

The nutritional status was evaluated through the Mini-Nutritional Assessment Short-Form (MNA-SF®) and body composition. The MNA-SF is a validated nutrition screening and assessment tool designed to elderly evaluation. It consists of six questions related to: food intake, weight loss, mobility, psychological stress or acute illness and Body Mass Index (BMI) or calf circumference (Rubenstein et al., 2001). According to the guidelines of the questionnaire, when it is not possible to measure BMI, calf circumference should be used (Rubenstein et al., 2001). In this study, some volunteers were wheelchair users, which made impossible the BMI measurement. Therefore, in order to standardize the calculation of MNA-SF total score, the calf circumference measurement was used for all participants. The MNA-SF total score ranges from zero to 14 points (Rubenstein et al., 2001). The aged people who scored from 14 to 12 points were classified as nourished, from eleven to eight as at risk of malnutrition, and from seven to zero points as malnourished (Rubenstein et al., 2001).

The body composition refers to body height (cm), weight (Kg), BMI (kg/m^2), muscle mass (Kg) and body fat (%), and they were obtained through a bioelectrical impedance analysis using a bioimpedance balance (Tanita BC-601 – InnerScan) with 0.1% accuracy. The elderly that presented a BMI up to 18.5 was considered underweight, from 18.5 to 25.0 with normal weight, from 25.0 to 30.0 with overweight and over 30.0 as obese (WHO, 2000). The muscle mass was classified as low (male: <49 Kg; female: <35.4 Kg), good (male: from 49 to 62 Kg; female: from 35.4 to 44.7 Kg) or increased (male: >62 Kg; female: >44.7 Kg). For aged people, the body fat was considered low (male: <13%; female: <24%), good (male: 13-25%; female: 24-36%), increased (male: 25-30%, female: 36-42%) and high (male: >30%; female: >42%).

2.4 Statistical analyses

The dependent variable was composed by grouping the variables frailty and nutritional status (MNA-SF). Firstly, for frailty and nutritional status, the "pre-frail" and "robust"

subgroups and "at risk of malnutrition" and "malnourished" were grouped, respectively, in “non-frail” and “malnourished”. Thereafter, the variables frailty and nutritional status were overlapped being classified into three subgroups: (1) frail and malnourished; (2) non-frail and malnourished or frail and nourished; (3) non-frail and nourished.

The independent variables were sex, age, mobility, number of medications, dependence to perform ADL, maximal grip strength, muscle mass, body fat, BMI, number of decayed, missing and filled teeth, use and need of prosthesis, masticatory efficiency and how long the elderly residing in the nursing home. Initially, a descriptive analysis was performed in order to obtain central tendency measures (median), dispersion measures (percentile range) and frequency analysis of the data.

Subsequently, the frailty and MNA-SF scores were correlated using Spearman’s Correlation ($\alpha<0.05$), obtaining Correlation Coefficient (r^2). The association between dependent variable and independent variables was analyzed by Poisson Regression with robust variance ($\alpha<0.05$). Initially, a bivariate analysis was performed between the dependent and independent variables. The variables sex, age, mobility, number of medications, dependence for ADL, maximal grip strength, muscle mass, body fat and BMI reached, in the bivariate analysis, value of $p<0.20$, being included in the multivariate regression model.

A hierarchical approach procedure was performed into three steps to get the adjusted regression model. In the first step, the sex presented p-value>0.20 and was excluded of the model. The muscle mass was excluded ($p>0.20$) in the second step. In the last step, the variable mobility reached $p>0.20$, being excluded of the model. After the hierarchical approach, the adjusted regression model was composed by the following independent variables: age, number of medications, dependence for ADL, maximal grip strength, body fat and BMI. Variables with p-values<0.05 in the adjusted model were considered statistically significant. Measurements of Prevalence Ratio (PR) and 95% Confidence Interval (95%CI) were obtained. The descriptive

and inferential analyzes were performed using the Statistical Package for Social Sciences software (SPSS for Windows, version 20.0, SPSS Inc, Chicago, IL, USA).

3. Results

In Piracicaba, of a universe of 484 institutionalized elderly, 204 participated of the study and 280 were excluded, being 22 for hearing and/or communication impairment, 238 for presenting neurological and/or cognitive disorders and 20 for refuse to participate. The number of aged people residing in nursing homes in João Pessoa was 339. Out of this total, 140 were included and 199 excluded of the research, being 192 for neurological and/or cognitive disorders and seven for refuse. Therefore, in the two cities, out of 823 elderly that lived in nursing homes, 344 were participants of the study and 479 were excluded due to hearing and/or communication impairment (n=22), presenting neurological and/or cognitive disorders (n=430) and refusing to participate (n=27).

The institutionalized elderly had a mean age of 77.70 years (Table 2). Most of elderly were females (n=206, 59.9%), wandering with no assistance and were frail and malnourished (Table 1). In mean, the elderly were living in the nursing home for four years and six months.

Table 1. Characterization of institutionalized elderly regarding sex, mobility, frailty and nutritional status.

	Frequency	
Variable	**n**	**%**
Sex		
Male	138	40.1
Female	206	59.9
Mobility		
Bedridden	15	5.2

Wheelchair	67	19.5
Ambulate with assistance	90	26.2
Wandering with no assistance	169	49.1
Frailty		
Robust	47	13.7
Pre-frail	97	28.2
Frail	200	58.1
Nutritional Status		
Nourished	144	42.0
At risk of malnutrition	149	43.4
Malnourished	50	14.6
Frailty and Nutritional Status		
Robust and nourished	83	24.2
Robust and malnourished or frail and nourished	121	35.3
Frail and malnourished	139	40.5

On average, volunteers took more than five medications a day, consequently presenting polypharmacy (Table 2). Regarding physical status, the median of the Katz Scale was zero, indicating that most of included elderly were independent (Table 2). The participants of this study had a BMI with a median of 25.50. Thereby, most of them were classified as overweight (Table 2).

Table 2. Description of the quantitative variables included in the study.

Variable	**Average**	**Standard Deviation**	**Median**	**Quart 25-75**
Age (years)	77.70	9.10	77.00	71.00-85.00

Number of medications	5.23	4.06	5.00	2.00-7.00
Katz Scale	1.39	1.96	0.00	0.00-2.00
Calf circumference (cm)	33.15	4.46	33.00	30.50-36.00
Maximal grip strength (Kgf)	15.44	8.80	14.00	8.80-22.00
Body height (cm)	1.58	0.11	1.60	1.50-1.68
Weight (Kg)	65.31	13.88	64.25	54.20-75.15
BMI (kg/m^2)	27.12	19.38	25.50	22.52-29.00
Muscle mass (kg)	42.31	8.60	40.85	35.30-48.40
Body fat (%)	31.12	9.79	30.85	25.02-37.17

Considering that the BMI median of male and female participants were, respectively, 22.4 and 25.6, the maximal grip strength measured for both sexes was low (Table 3). Despite the median of muscle mass and body fat are adequate for female volunteers, male presented a low muscle mass and increased body fat percentage (Table 3).

Table 3. Description of the variables: calf circumference, maximal grip strength body height, weight, BMI, muscle mass and body fat, according to sex.

Variable	**Sex**			
	Male		**Female**	
	Median	Quart 25-75	Median	Quart 25-75
Calf circumference (cm)	33.5	31.7-36.3	32.7	30.0-36.0
Maximal grip strength (Kgf)	22.0	13.9-27.0	11	7.1-15.0
Body height (cm)	1.68	1.62-1.67	1.51	1.48-1.58
Weight (Kg)	71.3	61.2-79.1	59.9	51.1-69.1
BMI (kg/m^2)	25.4	22.4-28.4	25.6	22.6-29.4
Muscle mass (kg)	48.3	44.0-53.2	37.1	33.8-40.5
Body fat (%)	28.2	22.3-33.0	34.8	27.7-40.5

A moderate negative correlation ($p<0.001$; r^2=-0.441) was observed among frailty and nutritional status scores, indicating that the greater the frailty (mean=2.79±1.74), the lower the nutritional status (mean=10.52±2.9) of the included elderly.

The multivariate adjusted model of Poisson regression showed that frailty and malnutrition were more frequent in older (PR=1.009, 95%IC=1.003-1.016, median=79.0; percentile 25-75=73.0-87.0) institutionalized elderly ($p<0.05$; Table 4). The participants in this study who took more medications had higher frequency of frailty and malnutrition (PR=1.016, 95%CI=1.006-1.027, $p<0.05$; Table 4). In addition, as the Katz Scale score increased, frailty and malnutrition became more frequent in aged people residing in nursing homes (PR=1.061, 95%CI=1.016-1.108, $p<0.05$; Table 4). Therefore, advanced age, the presence of polypharmacy and the greater dependence to perform ADL are risk factors to frailty and malnutrition emerge in institutionalized elderly.

Volunteers with higher maximal grip strength had less frequency of frailty and malnutrition (PR=0.992, 95%IC=0.986-0.998, $p<0.05$; Table 4). In addition, frailty and malnutrition were less frequent in institutionalized elderly with greater BMI (PR=0.997, 95%IC=0.996-0.998, $p<0.01$; Table 4). Therefore, higher maximal grip strength and greater BMI are protective factors for triggering frailty and malnutrition in elderly living in nursing homes.

Table 4. Distribution of institutionalized elderly in not adjusted and adjusted Poisson regression multivariate models for frailty and nutrition status and independent variables.

	Frailty and Nutritional Status			**Multivariate not adjusted**		**Multivariate adjusted**	
Variable	Non-frail and nourished n(%)	Non-frail and malnourished or frail and nourished n(%)	Frail and malnourished n(%)	p-value	PR (95% CI)	p-value	PR (95%CI)
Sex							
Male	42(30.4)	55(39.9)	41(29.7)	0.729	1.027(0.884-1.192)	-	-
Female	41(20.0)	66(32.2)	98(47.8)		Ref.		
Mobility							
Bedridden	0(0.0)	5(27.8)	13(72.2)	0.814	0.983(0.849-1.137)	-	-
Wheelchair	8(12.1)	16(24.2)	42(63.6)	0.917	1.019(0.718-1.445)	-	-
Ambulate with assistance	14(15.6)	34(37.8)	42(46.7)	0.089	1.101(0.985-1.230)	-	-
Wandering with no assistance	61(36.1)	66(39.1)	42(24.9)		Ref.		
	Frailty and Nutritional Status			**Multivariate not ajusted**		**Multivariate adjusted**	
Variable	Non-frail and nourished median (q25-q75)	Non-frail and malnourished or frail and nourished median (q25-q75)	Frail and malnourished median (q25-q75)	p-value	PR (95% CI)	p-value	PR (95%CI)
Age (years)	75.0(68.0-80.0)	78.0(71.0-84.0)	79.0(73.0-87.0)	0.014	1.007(1.002-1.013)	**0.002**	**1.009(1.003-1.016)**
Number of medications	3.0(2.0-5.0)	5.0(2.0-7.0)	6.0(3.0-9.0)	0.002	1.017(1.006-1.027)	**0.002**	**1.016(1.006-1.027)**
Katz Scale	0.0(0.0-0.0)	0.0(0.0-1.0)	2.0(0.0-5.0)	0.039	1.045(1.002-1.090)	**0.008**	**1.061(1.016-1.108)**
Maximal grip strength	18.9(11.7-25.0)	15.0(10.0-22.0)	11.4(7.0-17.0)	0.095	0.993(0.986-1.001)	**0.010**	**0.992(0.986-0.998)**
Muscle mass (kg)	44.0(39.7-50.9)	40.3(35.1-47.3)	38.4(33.8-44.5)	0.190	0.994(0.985-1.003)	-	-
Body fat (%)	32.2(26.6-40.5)	29.7(24.3-36.8)	32.8(25.0-36.5)	0.052	0.995(0.990-1.000)	0.056	0.995(0.990-1.000)
BMI (Kg/m^2)	26.7(23.3-30.7)	24.7(22.4-28.3)	25.5(22.1-28.8)	0.007	0.998(0.997-1.000)	**0.000**	**0.997(0.996-0.998)**

PR: Prevalence Ration; 95%CI: 95% Confidence Interval; Ref.: Reference category used in Poisson regression.

4. Discussion

This multicenter study evaluated the risk or protective factors associated with the coexisting of frailty and malnutrition in elderly living in nursing homes, once the aging process is commonly accompanied by the presence and overlap of frailty and malnutrition (Laur et al., 2017; Woo et al., 2017; Dominguez; Barbagallo, 2017). Such circumstance increases the elderly institutionalization due to the specialized care required by these geriatric syndromes (Kojima, 2018; Luppa et al., 2010). Our results demonstrated that, even in institutionalized elderly, the coexisting of frailty and malnutrition are associated with advanced age, greater use of medicines and dependence to perform ADL, lower maximal grip strength and BMI.

In our study, the prevalence of frailty was 58.1%, in agreement with Garrido et al. (2012) that also assessed the frailty phenotype in institutionalized elderly using a self-reported instrument adapted from Fried Index. Conversely, lower prevalence of frailty in elderly residing in nursing homes were observed in the SENIOR cohort (25.1%) (Buckinx et al., 2016) that used the Fried Index and in a Chinese cross-sectional study (21.5%) (Ge et al., 2019) by applying a specific instrument to nursing home residents (FRAIL-NH). In addition, in the FINAL study (González-Vaca et al., 2014), 68.8% of the institutionalized elderly were considered frail according to a modified Fried Index, being verified a higher prevalence than our study. Besides the differences in relation to the criteria used to diagnose the frailty (Buckinx et al., 2016; Ge et al., 2019; González-Vaca et al., 2014), the variation in prevalence can also be explained by the volunteer selection criteria, once the SENIOR cohort (Buckinx et al., 2016) excluded elderly who were not able to walk or stand. The study from China (Ge et al., 2019) excluded those clinically unstable, and the FINAL study (González-Vaca et al., 2014) included aged people with cognitive impairment.

Regarding the nutritional status, we observed a prevalence of malnourished elderly of 14.6%, similar to previous reports (Zoghbi et al., 2014; Hallaj et al., 2015; Izawa et al., 2013;

Bourdel-Marchason et al., 2009). However, there is a wide prevalence range of malnutrition among aged people residing in long-term care institutions in previous studies (Zoghbi et al., 2014; Hallaj et al., 2015; Izawa et al., 2013; Bourdel-Marchason et al., 2009; Suominen et al., 2005; Madeira et al., 2008; Serrano-Urrea, 2014). The prevalence ranged between 29% (Suominen et al., 2005) to 2.8% (Serrano-Urrea, 2014). This could be explained by the heterogeneity in the nursing homes structure and in the elderly's physical and psychological state, which may influence the nutritional status (Madeira et al., 2008; Suominen et al., 2005; Serrano-Urrea, 2014).

Frail and malnourished were simultaneously found in 40.5% of the elderly included in this investigation. Furthermore, we found a moderate negative correlation among frailty and MNA-SF score. Some characteristics (weight loss, decreased body mass, functional capacity, weakness and lower cognitive status) coexist in the tools used to assess both geriatric syndromes, which may explain the overlap among frailty and malnutrition (Laur et al., 2017). Also, literature reports similar prevalence in nursing home residents (Kamo et al., 2017) and same correlation in community-dwelling aged (Muszalik et al. 2019). Hence, considering the greater mortality rates in elderly residing in nursing homes that simultaneously were frail and malnourished (Muszalik et al., 2019), it is important know the factors associated with the coexisting of these geriatric syndromes.

In this study, the overlap of frailty and malnutrition was more prevalent in older elderly. Studies that assessed separately frailty (Ge et al., 2019; Garrido et al., 2012; Carneiro et al., 2017; González-Vaca et al., 2014) and malnutrition (Zoghbi et al., 2014; Hallaj et al., 2015; Madeira et al., 2018) in elderly residing in nursing homes reported advanced age as an associated factor. This result confirms that these syndromes are related to the aging process (Dominguez; Barbagallo, 2017; Woo et al., 2017). The aging process causes sensory alterations leading to food intake impairment, malnutrition (Meier; Stratton, 2008), as well as

musculoskeletal changes and decreased physiological reserve leading to functional declines and, consequently, to fragility (Fried et al., 2001).

Indeed, our outcomes demonstrated the advanced age as a risk factor for these two conditions, which highlight that the elderly are not actively aging. Therefore, considering the reversibility of frailty and malnutrition even along aging (Kojima et al., 2019b), it is recommended more careful and specialized physical and nutritional monitoring for older seniors. In addition, these two geriatric syndromes are consequence of bad habits during all life (Kojima et al., 2019a). Thereby, to prevent frailty and malnutrition, it is necessary act in the beginning of the life, maintaining a healthy life style until the older age.

In addition, our findings showed that institutionalized aged people who took six medicines per day presented a greater risk of being simultaneously frail and malnourished. Although no previous study has evaluated the factors associated with coexisting frailty and malnutrition in institutionalized elderly, a greater number of medicines per day was associated with the presence of only frailty (Hasan et al. 2017; Garrido et al. 2012) or malnutrition (Hallaj et al. 2015). The association between frailty and polypharmacy is due to the presence of physical impairment in frail elderly, which increases the number of medications taken by these individuals (Hasan et al., 2017; Garrido et al., 2012). Contrasting with our results, a study conducted in Spain (Gutiérrez-Valencia et al., 2018), that only evaluated frailty phenotype, showed that non-frail institutionalized elderly took higher number of medications than the frail participants. However, it was observed a higher prevalence of under-prescribed medicines in the frail subjects (Gutiérrez-Valencia et al., 2018), explaining the divergent result. Regarding malnutrition, this outcome could be explained by the side-effects, as decreased appetite and alterations in taste and smell, caused by medicines, reduce the nutritional intake, leading to malnutrition (Hallaj et al., 2015).

Thus, a pharmacist in nursing homes would be of great value to strictly control medications, in order to avoid an indiscriminate use of medicines that may cause harmful drug interactions for the elderly's health. Moreover, in many nursing homes, elderly with cognitive and/or neurological impairment share dormitories with elderly with no cognitive impairment. In view of this, it can be hypothesized that there is an increase in the use of psychotropics to sleep by healthy aged people. Therefore, it is suggested that cognitively impaired elderly stay in separate dormitories from healthy ones.

We observed that the frailty and malnutrition overlap was more frequent in the elderly living in nursing homes who were dependent to perform activities of daily living. Other studies that evaluated frailty (Garrido et al., 2012; González-Vaca et al., 2014) and nutritional status separately (Zoghbi et al., 2014; Pereira et al., 2014; Izawa et al., 2013; Serrano-Urrea et al., 2014; Suominen et al., 2005) also observed the dependence to perform ADL as an associated factor. The ability of the elderly to perform ADL depends on their motor condition (Lino et al., 2008). Many institutionalized aged people have motor impairment that is expressed by decreased mobility, which could cause loss of muscle mass and strength, characteristics of the frailty phenotype (Fried et al., 2001). Similarly, mobility and muscle atrophy are factors considered in the assessment of malnutrition by the MNA-SF tool (Rubenstein et al., 2001) and it may explain the functional capacity of the elderly to perform ADL as a risk factor for malnutrition. However, some ADL previously performed by the elderly, such as cooking and cleaning, are done by nursing homes employees. Hence, it is important to insert the elderly in routine activities of the nursing homes in order to preserve their functional capacity, avoiding increased dependence.

Indeed, our results highlight that maximal grip strength is associated with overlap presence of frailty and malnutrition, even in elderly residing in nursing homes. This outcome is in concordance with the SENIOR cohort (Buckinx et al., 2016) and the FINAL study

(González-Vaca et al., 2014) that assessed factors associated with frailty in institutionalized elderly. Although studies in the literature did not evaluate the association between maximal grip strength and malnutrition in nursing home residents, it is known that a reduced maximal grip strength imply in loss of body muscle mass (Fried et al., 2001) and, consequently, may lead to frailty and malnutrition (Fried et al., 2001; Meier; Stratton, 2008). It brings out that physical activities must be stimulated in order to maintain muscle mass, increase resistance and maximum grip strength, which, ultimately, would prevent frailty and malnutrition in institutionalized elderly.

Moreover, we observed that the volunteers with a greater BMI, in lower frequency, were simultaneously frail and malnourished, being this result supported by other studies that only assessed the nutritional status (Hallaj et al., 2015; Bourdel-Marchason et al., 2009). However, the BMI does not evaluate body composition such as lean mass percentage (Madeira et al., 2018), which is an important factor for the frailty diagnosis (Fried et al., 2001). This also may explain the non-association between frailty and BMI in the FINAL study (González-Vaca et al., 2014). In contrast with our findings, Madeira et al. (2018) demonstrated that older people with normal weight and pre-obesity prevalently were at risk of malnutrition. Nevertheless, this study (Madeira et al., 2018) reported limitations to accurately measure weight and height whereas the participants presented difficulty to stand, shrinkage and vertebral collapse. In addition, although BMI cut-offs for aged people may be different from young adults, the WHO cut-off point was used to classify the elderly according to their BMI (Madeira et al., 2018), being a possible bias.

Even thought, to prevent frailty and malnutrition, it is essential preserve the elderly with adequate BMI. However, most nursing homes provide standardized food for residents, regardless of their nutritional needs. Therefore, the nursing homes should have a nutritionist performing nutritional monitoring of the elderly in order to identify early nutritional

deficiencies, which can be improved through food adequacy or supplementation. Thereby, it is possible maintain an adequate BMI and, consequently, the physical and nutritional status of the elderly.

Despite the drawbacks concerning the cross-sectional design of this study, which does not allow to determine if exposure precedes disease, and the information bias due to the influence of the elderly's memory and perception during the answer of the research tools, this study present robust contributions to literature. Firstly, this study contributes to minimize the literature gap regarding prevalence and factors associated with the overlap of frailty and malnutrition in elderly residing in nursing homes. Second, it is important to highlight that the multicenter feature imply in a better description of the Brazilian institutionalized elderly and improve the external validity of our results.

In this context, the findings of this study suggested that the care provided to frail and malnourished elderly should be based in sociodemographic, physical and nutritional characteristics, independently of the dwelling place. This scientific knowledge can guide the working process reorganization of nursing homes and the training of caregivers, in order to foment a comprehensive and multidisciplinary care based on the coexisting phenotypes among malnutrition and frailty, which may result in improved health and well-being, contributing to an active aging and a good quality of life of the institutionalized elderly.

5. Conclusion

Elderly residing in nursing homes presented high frequency of frailty and malnutrition, and these conditions were associated with advanced age; larger use of medicines and dependence to perform activities of daily life; and lower maximal grip strength and BMI.

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Conflict of Interest

All the authors declare no conflict of interest.

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3 DISCUSSÃO

Esse trabalho de dissertação avaliou por meio de uma revisão sistemática da literatura e meta-análise a influência da institucionalização na QV de idosos e sumarizou que idosos institucionalizados apresentam pior QV do que os moradores da comunidade no que tange aspectos físicos, sociais, ambientais e psicológicos. Além das instituições de longa permanência promoverem poucas atividades físicas, os idosos institucionalizados apresentam saúde geral comprometida, o que impede a participação nas atividades físicas ofertadas (Bodur & Cingil, 2009; Cucato et al., 2016; Kuok et al., 2017). Em acréscimo, viver em uma instituição de longa permanência priva os idosos de contato com familiares e amigos, contribuindo para o isolamento social (Bodur & Cingil, 2009, Dagios et al., 2015; Even-Zohal, 2014). Além disso, a institucionalização exige que o idoso se adapte a uma nova rotina e ambiente, o que pode ser encarado de forma negativa (Bodur & Cingil, 2009). Assim, a ausência de atividades físicas, a falta de interação social e as mudanças ambientais decorrentes do processo de institucionalização podem levar ao desenvolvimento de sintomas depressivos no idoso (Kuok et al., 2017, Vitorino et al., 2013). Todos esses aspectos contribuem para a pior QV do idoso institucionalizado.

Considerando esse resultado, tornou-se importante realizar uma ampla avaliação dos idosos institucionalizados no que diz respeito a condição bucal, os estados nutricional e físico e a QVRSB, bem como suas interrelações. Assim, é possível melhor compreender o contexto e a situação de saúde desses indivíduos, o que possibilita a elaboração de estratégias de intervenção que visem promover melhor QV. Sendo assim, o primeiro passo foi avaliar a influência da condição bucal do idoso institucionalizado no seu estado nutricional e na sua QVRSB. A partir dessa avaliação, observou-se que o edentulismo em conjunto com a ausência de prótese está associado a piores resultados de performance mastigatória e limiar de deglutição em idosos residentes em instituições de longa permanência. Esse resultado enfatiza a importância da reabilitação protética na manutenção da função mastigatória e indica a necessidade de implementação de programas de prevenção da perda dentária e promoção de reabilitação oral nas instituições.

Além disso, a comprometida função mastigatória dos idosos impactou negativamente sua QVRSB, apensar de não ter afetado seu estado nutricional e sua composição corporal. Sendo assim, o desconforto, a dificuldade e a interrupção durante a alimentação decorrentes dos problemas mastigatórios afetam a vida do idoso (Atchison & Dolan, 1990; da Silva et al., 2001; Slade, 1997; Oliveira & Nadanovsky, 2005). Portanto, deve-se restabelecer

a função mastigatória desses indivíduos por meio de acesso a serviços de saúde bucal nas próprias instituições com o intuito de melhorar sua QVRSB.

Apesar do comprometimento da função mastigatória não ter sido associado à desnutrição nos idosos institucionalizados, sabe-se que na vida o idoso está sendo exposto a vários fatores que podem afetar sua saúde. Além disso, comumente a desnutrição coexiste com outra síndrome geriátrica, a fragilidade (Laur et al., 2017; Kamo et al., 2017). Nesse contexto, um modelo multivariado foi elaborado de forma a incluir também fatores ligados a saúde geral dos idosos institucionalizados e a instituição, que poderiam estar associados a presença simultânea de fragilidade e desnutrição nesses indivíduos. Nossos achados mostraram que a coexistência de fragilidade e desnutrição foi alta e associada à idade avançada, maior uso de medicamentos, maior dependência na realização de atividades de vida diária, menor força de preensão palmar e menor IMC.

A associação da coexistência de fragilidade e desnutrição com uma idade mais avançada evidencia que as pessoas precisam ser incentivadas a manter um estilo de vida saudável que favoreça o envelhecimento ativo. A maior frequência da sobreposição de fragilidade e desnutrição em indivíduos com polifarmácia confirma a importância da atuação do farmacêutico nas instituições de longa permanência para idosos no que tange o controle do uso indiscriminado de medicamentos. A associação entre a sobreposição de fragilidade e desnutrição com a dependência para realização das atividades de vida diária expõe a necessidade de inserção dos idosos institucionalizados nas atividades rotineiras das instituições, a fim de evitar a diminuição da capacidade funcional e o aumento da dependência.

A menor frequência de coexistência de fragilidade e desnutrição em indivíduos com maior força de preensão palmar demonstra que a massa muscular dos idosos deve ser mantida por meio de atividades físicas, de forma a aumentar a força máxima de preensão e evitar o surgimento dessas síndromes geriátricas. Por fim, os voluntários com maior IMC, em menor frequência, apresentaram-se simultaneamente frágeis e desnutridos. Portanto, para evitar fragilidade e desnutrição, é essencial que o idoso tenha um IMC adequado, o qual pode ser mantido por profissional nutricionista da instituição com acompanhamento e intervenção nutricional.

Portanto, devido à natureza multicêntrica dos segundo e terceiro artigos que incluíram idosos institucionalizados de duas cidades brasileiras de regiões distintas, os resultados dessa dissertação constituem uma visão geral sobre a situação e as necessidades de saúde bucal e geral de idosos residentes em instituições longa permanência no Brasil. Vale ressaltar que no Brasil não há outros estudos que avaliaram idosos institucionalizados em uma

perspectiva multicêntrica. Dessa forma, os nossos resultados se tornam representativos e de grande valia no que tange a realidade da institucionalização de idosos no país.

Com isso, demonstra-se a necessidade de implementação de planos e estratégias de prevenção, intervenção, tratamento e acompanhamento desses idosos, de modo a diminuir o sofrimento relacionado à saúde e amenizar a situação de exclusão social vivida por esses indivíduos. Para isso, profissionais especializados como dentistas, educadores físicos, fisioterapeutas, nutricionistas, psicólogos, médicos, fonoaudiólogos, terapeutas ocupacionais e assistentes sociais devem fazer parte da equipe das instituições. A partir dessa equipe multidisciplinar será possível implementar também atividades intersetoriais de cultura, recreação e esportes. Por fim, o processo de trabalho deve ser reorganizado, os cuidadores devem ser capacitados e a infraestrutura das instituições melhorada.

Nesse sentido, um formulário de socialização dos resultados dessa pesquisa (APÊNDICE 1) foi elaborado e entregue aos diretores das instituições de longa permanência para idosos, com o intuito de auxiliar na elaboração de ações direcionadas a real situação de saúde do idoso institucionalizado. Além disso, foi realizado um curso de capacitação com os cuidadores das instituições de longa permanência, a fim de prover informações sobre mudanças em saúde bucal decorrentes do processo de envelhecimento, bem como sobre higienização bucal para pessoa idosa e desdentada. Para esse curso, um panfleto sobre saúde bucal do idoso (APÊNDICE 2) foi elaborado, sendo um material guia para realização do cuidado em saúde bucal dos idosos nas instituições de longa permanência. Assim, espera-se proporcionar QV, bem-estar, saúde bucal e geral, justiça, dignidade, participação, respeito e autonomia aos idosos institucionalizados.

4 CONCLUSÃO

Esse trabalho de dissertação concluiu que idosos institucionalizados apresentam pior QV do que os idosos moradores da comunidade. Entretanto, os artigos avaliados na revisão sistemática apresentaram baixa qualidade de evidência científica devido à presença de vieses metodológicos. Portanto, estudos primários bem delineados devem ser realizados para confirmar essa evidência.

Ademais, a presença de dentes e o uso de prótese influenciou a performance mastigatória e o limiar de deglutição em uma amostra multicêntrica de idosos residentes em instituições de longa permanência. Apesar disso, a performance mastigatória e o limiar de deglutição não influenciaram o estado nutricional e a composição corporal de idosos institucionalizados, apesar de terem comprometido sua QVRSB.

Por fim, a frequência de coexistência de fragilidade e desnutrição em amostra multicêntrica de idosos residentes em instituições de longa permanência foi alta. Além disso, a sobreposição dessas duas síndromes geriátricas foi associada à idade avançada, maior uso de medicamentos, maior dependência para realização de atividades de vida diária, menor força de preensão palmar e menor IMC.

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APÊNDICES

APÊNDICE 1 – Formulário de socialização dos resultados da pesquisa

ILPI: _____

Nome: _____

Idade: _____ anos

Peso: _____ Kg Altura: _____ m

IMC: _____ % Gordura _____

Estado Cognitivo (MEEM) _____

Interpretação: Bom (>23), Adequado (18 a 22), Ruim (<18)

Estado Nutricional (MNA) _____

Interpretação: Normal (12 a 14), Risco de desnutrição (8 a 11)
Desnutrido (0 a 7)

Fragilidade

( ) Frágil ( ) Potencialmente Frágil ( ) Não-Frágil

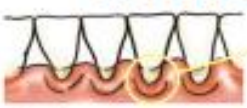
Necessidades de Tratamento Odontológico:

( ) Cárie/Restauração ( ) Exodontia
( ) Remoção de cálculo (tártaro)
( ) Melhorar Higiene dos Dentes e/ou Prótese
( ) Necessidade de instalar/trocar prótese dentária

APÊNDICE 2 – Panfleto sobre saúde bucal do idoso

SAÚDE BUCAL DO IDOSO

MUDANÇAS DA BOCA AO ENVELHECER



1 Perda de osso

2 Mucosa fina e sensível

3 Dentes escuros

4 Diminuição da saliva

O QUE CAUSA A PERDA DOS DENTES

1

Cárie

2 Doença na gengiva

Biofilme Dental: Bactérias + Restos de alimentos

COMO EVITAR A PERDA DOS DENTES

1 Usar fio dental

Escovar os dentes 2

3 Limpar a língua

HIGIENIZAÇÃO DA BOCA DE PESSOAS SEM DENTES

1 Gengiva e bochechas: algodão ou gaze embebidos com água

2 Língua: Escova macia ou limpador de língua

COMO LIMPAR AS DENTADURAS

Cuidado Diário

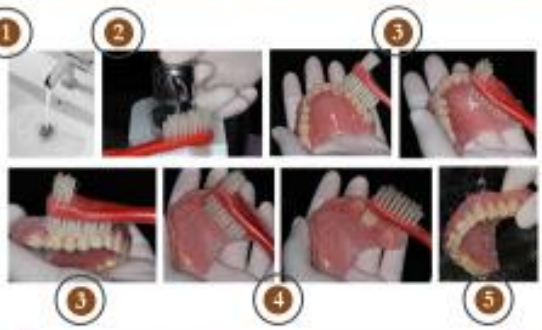
1 Encher a pia com água

2 Usar escova para dentaduras ou macia e sabão neutro

3 Escovar a parte externa da dentadura

4 Escovar a parte interna da dentadura

5 Enxaguar em água corrente



Cuidado Noturno

Remover a dentadura, limpar, colocar em copo com água e tampa

Cuidado Semanal

→ *Para próteses* ***SEM METAL*** ⚠

1 colher de sopa de Hipoclorito de Sódio em 1 copo de água por 10 min.

→ *Para próteses* ***COM METAL*** ⚠

1 pastilha efervescente em 1 copo de água por 15 min.

Parceria: Faculdade de Odontologia de Piracicaba FOP/UNICAMP | Associação de Assistência Social Betel Lar Betel/Piracicaba

Autor: Mariana Marinho Davino de Medeiros

ANEXOS

ANEXO 1 – Aprovação do Comitê de Ética em Pesquisa da Faculdade de Odontologia de Piracicaba

UNICAMP - FACULDADE DE ODONTOLOGIA DE PIRACICABA DA

PARECER CONSUBSTANCIADO DO CEP

Elaborado pela Instituição Coparticipante

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Condição bucal e estados físico, nutricional, mental e psicossocial de idosos em instituições de longa permanência

Pesquisador: Yuri Wanderley Cavalcanti

Área Temática:

Versão: 2

CAAE: 66122917.6.3001.5418

Instituição Proponente: Faculdade de Odontologia de Piracicaba - Unicamp

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 2.895.830

Apresentação do Projeto:

Transcrição editada do conteúdo do registro do protocolo e dos arquivos anexados à Plataforma Brasil

Trata-se de protocolo em coparticipação que foi originalmente aprovado pelo CEP da UFPB em 26 de Maio de 2017, emendado e aprovado para inclusão de centro coparticipante (FOP-UNICAMP) em 24 de Julho de 2018.

METODOLOGIA:

Delineamento da pesquisa: Trata-se de estudo clínico observacional, transversal, realizado em duas cidades (João Pessoa – PB e Piracicaba – SP) e múltiplos sítios de coleta de dados, que envolverá 459 idosos institucionalizados de longa duração, com idade de 60 anos ou mais, que serão avaliados por meio de avaliação da condição de bucal (experiência de cárie, necessidade de tratamento odontológico, uso e necessidade de próteses e avaliação do estado geral da prótese); escala de Independência em Atividades da Vida Diária (EIAVD); avaliação da fragilidade de idosos (modelo descrito por Nunes); avaliação nutricional (instrumento Mini-Nutritional Assessment – MNA), avaliação de estado mental (MiniExame do Estado Mental - MEM); Avaliaçao da auto-percepção da qualidade de vida relacionada à saúde bucal; avaliação da qualidade de vida relacionada à saúde (Questionário SF – 12), avaliação da eficiência mastigatória e do limiar de deglutição.

Critérios de inclusão: Para fazer parte deste estudo, os idosos serão selecionados segundo os

Endereço: Av.Limeira 901 Caixa Postal 52
Bairro: Areião **CEP:** 13.414-903
UF: SP **Município:** PIRACICABA
Telefone: (19)2106-5349 **Fax:** (19)2106-5349 **E-mail:** cep@fop.unicamp.br

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Continuação do Parecer: 2.895.830

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1185608.pdf	06/09/2018 12:15:59		Aceito
Outros	Carta_Resposta_FOP.pdf	06/09/2018 12:13:36	Yuri Wanderley Cavalcanti	Aceito
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Outros	20180830_ProjetoIdosos_corrigido2.pdf	30/08/2018 14:10:25	Yuri Wanderley Cavalcanti	Aceito
Declaração de Instituição e Infraestrutura	20180830_Declaracao_instituicao.pdf	30/08/2018 13:52:15	Yuri Wanderley Cavalcanti	Aceito
Declaração de Pesquisadores	20180815_Declaracao_pesquisadores.pdf	30/08/2018 13:50:19	Yuri Wanderley Cavalcanti	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	201808123_TCLE_CEP_FOP.docx	30/08/2018 13:45:13	Yuri Wanderley Cavalcanti	Aceito
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TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE_UFPB_UNICAMP_06072018.docx	06/07/2018 08:47:26	Yuri Wanderley Cavalcanti	Aceito
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Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

PIRACICABA, 14 de Setembro de 2018

Assinado por:
jacks jorge junior
(Coordenador)

Endereço: Av.Limeira 901 Caixa Postal 52
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ANEXO 2 – Manuscrito publicado BMC Geriatrics

Medeiros *et al. BMC Geriatrics* (2020) 20:44
https://doi.org/10.1186/s12877-020-1452-0

BMC Geriatrics

RESEARCH ARTICLE Open Access

Does the institutionalization influence elderly's quality of life? A systematic review and meta–analysis

Mariana Marinho Davino de Medeiros[1], Talita Malini Carletti[1], Marcela Baraúna Magno[2], Lucianne Cople Maia[2], Yuri Wanderley Cavalcanti[3*] and Renata Cunha Matheus Rodrigues-Garcia[1]

Abstract

Background: Institutionalization is a global phenomenon and its impact on elderly's quality of life (QoL) is under discussion. This systematic review and meta-analysis evaluated the influence of the institutionalization on elderly's QoL.

Methods: Searches were performed in Medline, Scopus, Web of Science, Lilacs, Cochrane Library and SIGLE by two independent reviewers up to May 2019. The eligibility criteria were based on PECO strategy, considering observational studies in elderly (P), which were (E) or not (C) institutionalized to identify differences in their QoL (O). For qualitative synthesis, data were extracted and risk of bias was evaluated through a validated guideline. Meta-analysis was based on Mean Difference (MD) and Standard Mean Difference (SMD) calculation ($p \leq 0.05$). The evidence was quality-tested using Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

Results: The initial search identified 3841 articles. Duplicates were removed, titles and abstracts were read and eligibility criteria were applied, remaining 16 sixteen cross-sectional studies that were included for data extraction and qualitative synthesis. Out of 16 articles, 14 evaluated the Health-Related Quality of Life, using Leipad ($n = 2$), WHOQOL-BREF and/or OLD ($n = 8$), SF-36 or RAND-36 ($n = 4$) questionnaires, and two assessed the Oral Health–Related Quality of Life, through GOHAI questionnaire. One eligible article was considered as low risk of bias. In the meta-analysis, 12 studies were included. Leipad questionnaire did not show differences on elderly's QoL (MD 0.11 [– 0.10, 0.32] $I^2 = 76\%$). Differences on elderly's QoL were detected through WHOQOL-BREF (SMD -0.70 [CI95%: – 0.94, – 0.47] $I^2 = 93\%$), WHOQOL-OLD (SMD -1.13 [– 1.47, – 0.80] $I^2 = 91\%$) and SF-36/RAND-36 (MD -5.97 [CI95%: – 11.29, – 0.64] $I^2 = 90\%$). All studies had very low or low certainty of evidence, since the study design influenced evidence classification, and show high heterogeneity.

Conclusion: Although the institutionalization influences negatively the elderly's QoL, further well-designed studies are needed to confirm this evidence.

Keywords: Aged, Institutionalization, Nursing homes, Independent living, Quality of life

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ANEXO 3 – Protocolo de submissão Journal of Oral Rehabilitation

De: Akshay Nair <onbehalfof@manuscriptcentral.com>
Assunto: Manuscript submitted - JOR-20-0070
Data: 5 de fevereiro de 2020 09:30:09 BRT
Para: regarcia@fop.unicamp.br
Responder A: JOORedoffice@wiley.com

05-Feb-2020

Dear Dr. Renata Rodrigues Garcia,

Thank you for submitting your manuscript entitled "Masticatory function influences oral health-related quality of life, despite it is not correlated with nutritional status of elderly in nursing homes" to the Journal of Oral Rehabilitation.

Your manuscript will now be screened by the Editor in Chief of JOR. If your manuscript is of interest to JOR, it will immediately be sent for review.

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ANEXO 4 – Protocolo de submissão Archives of Gerontology and Geriatrics

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*** Automated email sent by the system ***

Dear Dr. Mariana Marinho Medeiros,

You have been listed as a Co-Author of the following submission:

Journal: Archives of Gerontology and Geriatrics
Title: Factors associated with the overlap of frailty and nutrition in institutionalized elderly: a multicenter study
Corresponding Author: Renata Rodrigues Garcia
Co-Authors: Mariana Marinho D Medeiros, DDS; Olivia Maria C Figueredo, DDS. MS; Mayara A Pinheiro, DDS, MS; Luiz Fabrício S Oliveira, DDS, MS; Rayssa L Wanderley, DDS; Yuri W Cavalcanti, PhD;

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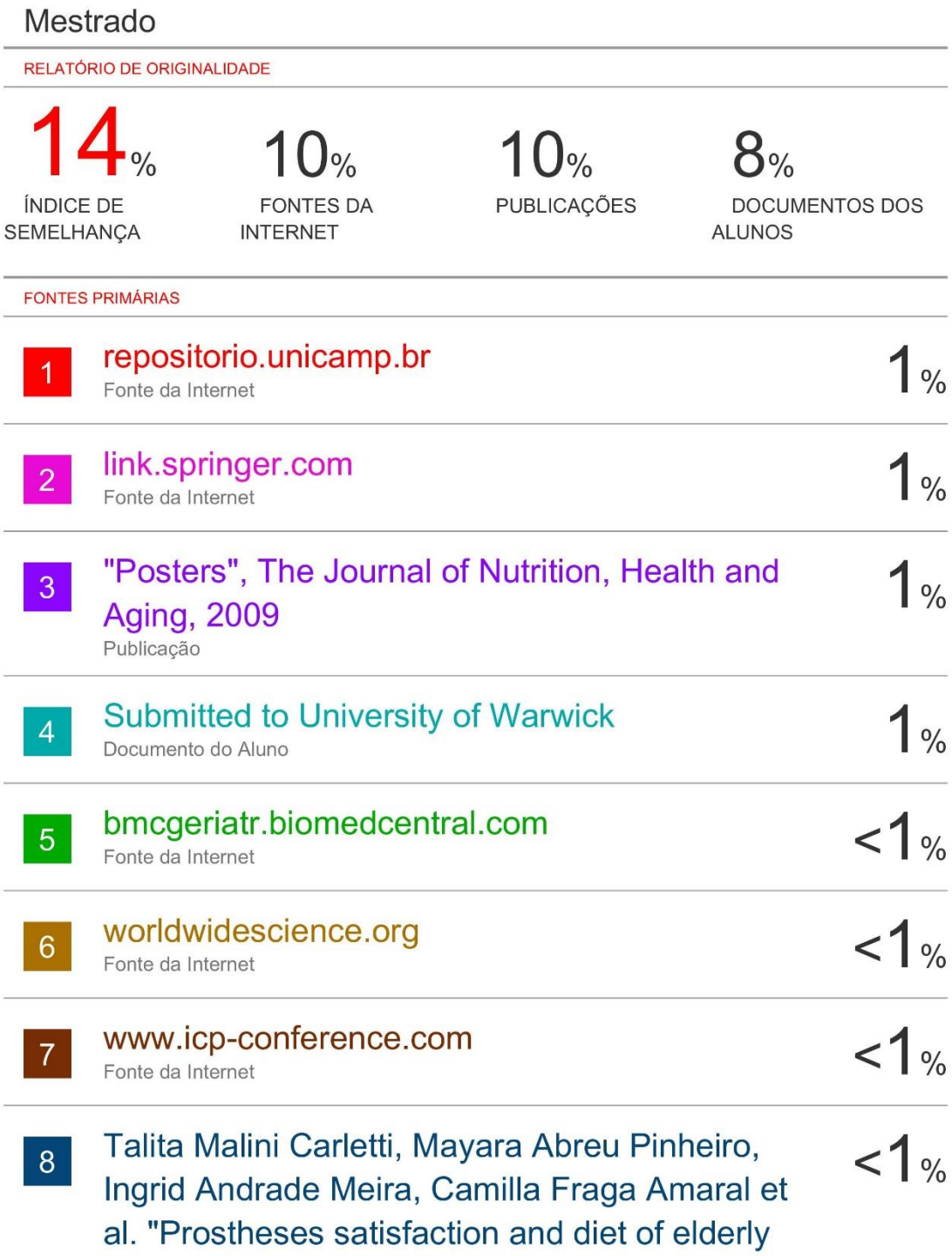
Archives of Gerontology and Geriatrics

ANEXO 5 – Relatório final de similaridade



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